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ABSTRACT

This document contains the efforts of a group of teachers to develop curricular materials designed to correlate the subject matter of mathematics with that of a shop course in power mechanics. It is not an adaptation of traditional courses in mathematics, but an attempt to integrate the subject matter of mathematics into the concepts utilized in power mechanics classes. Content is presented under the following chapter headings: Fractions, Decimals, Per Cent, Ratio and Proportion, Directed Numbers, Formulas, Metric System, Geometry, Powers and Roots, and Shop Business. These sections of study are designed to be as inclusive as possible. Included are all activities with which a student will be involved in a teaching situation, along with evaluation materials, worksheets, guides, and other materials that will be used. Each unit or topic includes a bibliography preceded by a list of equipment, films, and other supplies. (JP)

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NATCHITOCHES CENTRAL HIGH SCHOOL

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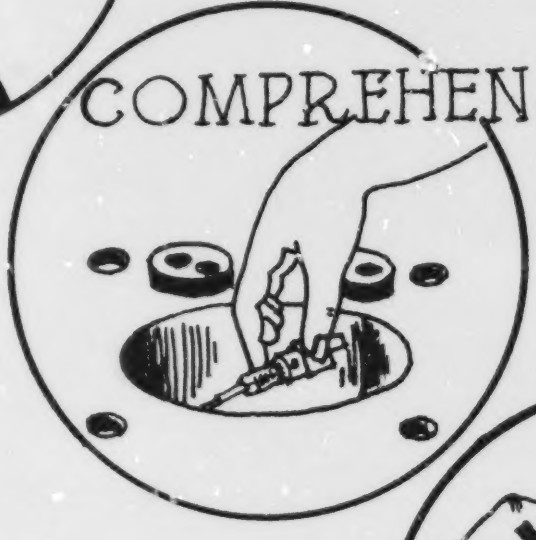

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MATH FOR INDUSTRY

APPLICATION =

NATCHITOCHES LOUISIANA

BOOK 1

Introduction

The materials you are about to use were developed in the summer of 1972 by teachers experienced in teaching the subject areas involved. These materials were developed with respect to the concept of performance objectives as organized by EPIC Diversified Systems Corporation of Tuscon, Arizona. EPIC was retained by the Natchitoches Parish School Board to serve as monitor and evaluator of this Interest-Based Curriculum.

The instructional materials developed in English, mathematics and science correlate the vocabulary, terminology, concepts and skills of power mechanics to each academic area involved. For the sake of consistency, the format utilized herein contains certain symbols and abbreviations as instructional guides.

Objectives within the documents were divided into four categories; (1) Program Objectives; (2) Performance Objectives: (3) Process Objectives; and (4) Activities. These are categorized by the numbering system preceding each objective or activity. For example, the number sequence 8-1-3 refers to: Performance Objective number eight, signified by the first numeral; process objective number one, represented by the second numeral; and activity number three, indicated by the third numeral. The numbers in parenthesis beneath each sequence $\overset{8\text{-}1\text{-}3}{(2,7,4)}$ indicate the Program Objectives, to which each Process Objective relates. This identification system allows immediate identification of the objective(s) covered and assists in establishing a Project Monitorial System, referred to by the abbreviation PMS.

These courses of study are designed to be as inclusive as possible. Included are all activities with which a student will be involved in a teaching situation, along with many of the evaluation materials, worksheets, guides, and other materials that will be used. Each unit or topic is terminated by a bibliography preceded by a list of equipment, films and other supplies.

Copies of these materials may be obtained from the Louisiana State Department of Education. If not available there, they may be secured by writing to:

Mr. Trent Melder, Coordinator
Natchitoches Central High School
Natchitoches, Louisiana 71457

Cost is $2.50 per booklet to cover expenses involved in preparation, handling and shipping.

Foreword

Within the pages of this document are contained the efforts of a group of teachers to develop curricula materials designed to correlate the subject matter of mathematics with that of power mechanics. The purpose of these efforts is twofold. First, it is the opinion of those involved that the subject matter of academic areas should be taught to students in a way that is both useful for their future aspirations and meaningful to them as citizens of our community, state, and nation. Second, by utilizing an interest-based curriculum, it is felt that the interest of students in their academic areas will be heightened, thereby improving their achievement in those subjects involved.

This course of study is not an adaptation of the traditional course or courses in mathematics to a level compatible with the achievement of students involved. Quite the contrary is true. Every effort has been expended to assure that basic concepts and ideas in measurement, fractions, ratio and proportion, and other topics involved, have been included. (The foremost change has been to integrate the subject matter of mathematics into the concepts utilized in power mechanics classes.) Utilizing this approach to the teaching of mathematics opens to students two possibilities upon graduation: First, they will be able to utilize the skills gained in power mechanics to enter actively into a vocation. Second, should their aspirations include post-secondary study, the knowledge gained through the correlated mathematics classes opens this door to them also.

Development of the materials contained herin was most difficult and time consuming, however, the results are immeasurably rewarding. The opportunity to develop these and other materials was made possible by an ESEA Title III Grant. Our thanks are extended to the Louisiana State Department of Education for its assistance and encouragement.

Teachers involved in the development of these materials include the following:

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UNIT I

FRACTIONS

FRACTIONS

1-0-0 Upon completion of this topic the students will show a basic understanding of fractions and the terminology involved by scoring 70% or above on a teacher made test.

1-1-0 The project teacher will use a steel rule, Merrill Skilltape, and filmstrips to teach the meaning of fractions.

1-1-1 Use the steel rule to show fractional parts.
1-1-2 Use Cyclo-teacher M-67
1-1-3 Merrill Skilltapes--Understanding Fractions A through D
1-1-4 Teacher prepared work sheet on understanding fractions

1-2-0 The project teacher will use the steel rule to teach reducing or raising fractions to equivalent terms. Example: $\frac{12}{16} = \frac{3}{4} = \frac{24}{32}$

1-2-1 Measure several bolts and nuts.
1-2-2 Measure a cylinder.
1-2-3 Work sheet on equivalent fractions
1-2-4 Students will write the first ten equivalent fractions for the following: 1/2, 1/4, 1/8, 1/16.

1-3-0 The project teacher will use various tools to teach arranging fractions in sequence.

1-3-1 Arrange a set of socket wrenches in order from least to greatest.
1-3-2 Measure a bolt, then select the correct size wrench to fit the bolt.
1-3-3 Arrange a set of Allen wrenches in order from least to greatest.
1-3-4 Measure a hollow-head set screw and select an Allen wrench to fit it.
1-3-5 Arrange a set of fractions in order from least to greatest.

1-4-0 The project teacher will use a cassette tape and accompanying work sheet for additional fractions not covered by 1-2-0 and 1-3-0.

1-4-1 Students will listen to tape, then complete accompanying work sheet.

1-5-0 The project teacher will use the steel rule as a number line to teach pupils to add common fractions.

1-5-1 Demonstration on overhead projector
1-5-2 Practical addition of fractions on the steel rule
1-5-3 Work sheet with problems involving addition of fractions on the steel rule.

1-6-0 The project teacher will use prepared cassettes and programmed materials to teach common denominators and mixed numbers with fractions not found on the steel rule.

1-6-1 Listen to cassette tape and complete work sheets.
1-6-2 Do programmed work from Cyclo-teacher. M-73
1-6-3 Merrill Skilltapes, Addition of Fractions A & B
1-6-4 Complete teacher constructed work sheet on practical shop problems involving addition of fractions.

1-7-0 The project teacher will use the steel rule as a number line to teach pupils to subtract common fractions.

1-7-1 Demonstration on overhead projector
1-7-2 Work sheet with problems involving subtraction of fractions on the steel rule.

1-8-0 The project teacher will use prepared cassettes and programmed materials to teach subtraction of fractions involving mixed numbers and fractions not found on the steel rule.

1-8-1 Listen to cassettes and complete work sheet.
1-8-2 Do programmed work from Cyclo-teacher. M-73
1-8-3 Complete teacher constructed work sheet on practical shop problems involving subtraction of fractions.

1-9-0 The project teacher will use transparencies and a steel rule to teach multiplication of a fraction times a whole number.

1-9-1 Work sheet - Fractions times whole numbers
1-9-2 Cyclo-teacher M-76

1-10-0 Teacher will use transparencies and a steel rule to teach multiplication of a fraction times a fraction.

1-10-1 Work sheet - Fraction times a fraction
1-10-2 Cyclo-teacher M-76

1-11-0 The project teacher will use transparencies and a chalk board to teach multiplication of a mixed number times a mixed number.

1-11-1 Work sheet - Fraction times a mixed number
1-11-2 Cyclo-teacher M-76

1-12-0 The project teacher will use transparencies and a chalk board to teach multiplication of a mixed number times a mixed number.

1-12-1 Work sheet - Mixed number times a mixed number
1-12-2 Cyclo-teacher M-76

1-13-0 The project teacher will use examples of practical applications to teach solving reading problems related to multiplication.

1-13-1 Teacher prepared work sheet

1-14-0 The project teacher will use transparencies and chalk board to teach division of fractions by relating this process to multiplication of fractions.

1-14-1 Work sheet - Rewrite division problems as multiplications
1-14-2 Solve the problems in 1-14-1
1-14-3 Cyclo-teacher M-78
1-14-4 Cassette tapes
1-14-5 Filmstrip
1-14-6 Teacher made work sheet related to problems in power mechanics

1-15-0 The project teacher will use lecture and chalk board to develop skills used in reading and solving problems.

1-15-1 Teacher and pupils write and solve problems.
1-15-2 Students will work in small groups to solve problems related to power mechanics on a teacher made work sheet.

1-16-0 The project teacher will administer evaluative materials to the students.

1-16-1 Evaluative materials

ACTIVITIES

1-1-4 Work sheet - Understanding Fractions

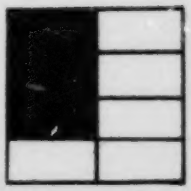
1. In the fraction 3/8 as indicated in the drawing to the right

   the 8 tells _____

   _____

   the 3 tells _____

   _____



2. The 8 is called the _____.

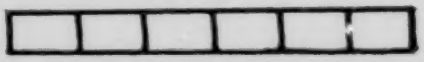
3. The 3 is called the _____.

4. 3/8 is a _____ fraction.

5. 9/8 is an _____ _____ fraction.

6. If 9/8 is written as 1 1/8 i is then called a _____ number.

7. Shade 5/6 of the following figure.

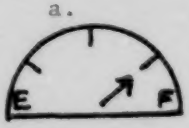


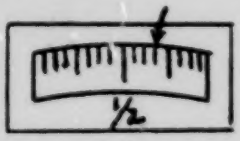
8. Use the steel rule to determine the length of the following line segements to the nearest 16th of an inch.

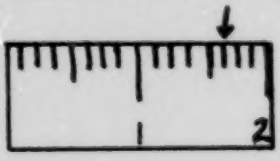
   a. _____ b. _____ c. ___ d. _____ e. _____

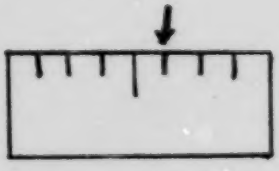
9. Tell what fraction is indicated by each of the following:

   a. b. c. d.









   _____ _____ _____ _____

10. Write each of the following as a fraction.

    a. 2 ÷ 3 b. 5 ÷ 4 c. 8) 7 d. 1 1/3

    _____ _____ _____ _____

11. Five months is what fractional part of one year? _____

12. Six days is what fractional part of a week? _____

13. Seven inches is what fractional part of a foot? _____

14. 15 minutes is what fractional part of an hour? _____

15. 20 seconds is what fractional part of a minute? _____

16. Change the following improper fractions to mixed numbers:

a. 3/2 _____

b. 5/3 _____

c. 7/6 _____

d. 9/2 _____

e. 7/4 _____

f. 7/2 _____

g. 17/16 _____

h. 25/8 _____

17. Change the following mixed numbers to improper fractions:

a. 1 1/4 _____

b. 3 1/2 _____

c. 2 3/4 _____

d. 3 1/8 _____

e. 1 15/16 _____

f. 2 5/8 _____

g. 4 1/3 _____

h. 2 3/5 _____

1-2-3 Work sheet - Equivalent Fractions

1. Complete the following exercises:

a. 1/3 = ____/12

b. 1/2 = ____/16

c. 8/64 = ____/8

d. 3/16 = ____/32

e. 4/64 = ____/16

f. 4/32 = ____/8

g. 3/5 = ____/25

h. ____/8 = 3/24

i. 1/2 = ____/6

j. 3/7 = ____/15

2. Rewrite the equivalent fractions in the blank to the right.

a. 1/2, 1/3, 2/4, 5/9 _____

b. 1/4, 3/8, 3/12, 4/14 _____

c. 7/8, 2/3, 14/16, 7/16 _____

d. 16/32, 4/8, 33/64, 8/16 _____

e. 8/64, 3/8, 1/8, 8/32 _____

f. 3/5, 9/15, 16/25, 5/10 _____

g. 1 1/2, 5/3, 1 1/3, 3/2 _____

h. 2 6/8, 11/4, 22/16, 2 3/4 _____

i. 3 1/4, 14/4, 13/4, 3 1/2 _____

j. 24/16, 1 3/4, 43/32, 1 1/2 _____

3. Reduce the following to lowest terms:

a. 4/6 = _____

b. 8/16 = _____

c. 8/32 = _____

d. 4/64 = _____

e. 5/125 = _____

f. 14/196 = _____

g. 26/169 = _____

h. 64/128 = _____

i. 25/625 = _____

j. 8/1000 = _____

4. For each of the following write a set containing five equivalent fractions:
   Example: 1/2, (2/4, 3/6, 5/10, 12/24, 25/50)

   a. 1/4

   b. 3/8

   c. 1/3

   d. 2/5

5. How many 1/16 inch are there in a 5/8 inch shackle bolt? _____

6. How many 1/16 inch are there in a 3/4 inch king pin? _____

7. There are 16/16 in an inch. How many 1/16 inch are there in the diameter of a 3 inch piston? _____

1-3-5 Work sheet - Arranging fractions in order

1. Arrange the following fractions in order from least to greatest:

   a. 1/2, 1/8, 3/8, 1/4 _____

   b. 3/8, 11/16, 5/16 5/8 _____

   c. 17/32, 33/64, 1/2, 9/16 _____

   d. 3/4, 15/16, 7/8, 3/16 _____

   e. 6/8, 1/16, 3/8, 3/16 _____

   f. 3/10, 31/100, 1/10, 299/1000 _____

   g. 9/10, 5/6, 4/5, 2/3 _____

   h. 5/12, 3/10, 7/16, 3/4 _____

   i. 3/5, 5/8, 3/4, 3/10 _____

   j. 11/32, 5/16, 3/8, 7/16 _____

1-5-3 Work sheet - Addition of fractions on a steel rule

1. Add the following fractions using the steel rule and reduce to lowest terms.

a. 3/4 + 1/4 =

b. 1/4 + 1/2 =

c. 5/16 + 3/4 =

d. 3/8 + 5/8 =

e. 5/16 + 5/16 =

f. 1 7/8 + 1 3/4 =

g. 2 1/4 + 2 7/8 =

h. 1 3/16 + 2 7/8 =

i. 1 5/8 + 2 3/4 =

j. 3/8 + 5/16 =

k. 5/32 + 1 13/64 =

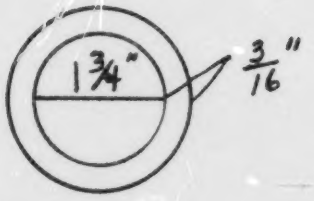
l. 7/8 + 3/4 + 5/16 =

m. 2 3/4 + 1 31/32 =

n. 21/32 + 1/2 + 5/64 =

o. 3/4 + 9/16 + 1/2 =

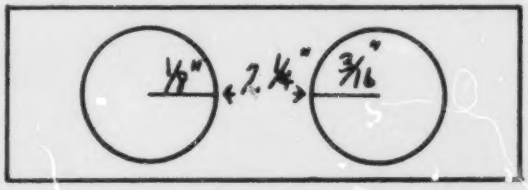
1-6-4 Work sheet - Practical shop problems



1. The inside measure of a pipe is 1 3/4 inches and the thickness of the wall is 3/16 inch. What is the outside diameter?

2. If a mechanic spends 2 1/2 hours on one job, 1 1/2 hours on another job, what is the total time involved?

3. Find the distance between the centers of the holes in the following diagram.



4. Two sections of heater hose need replacing. One length is 5 3/4 inches and the other section is 9 7/8 inches. What is the total length of hose needed?

5. If two pieces of metal are to be bolted together and one of the sheets is 5/16 inch thick and the other sheet is 7/8 inch thick, how long will the bolt have to be if you allow 1/4 inch for the nut?

6. If Bill, John, and Henry work to install a motor, Bill worked 2 1/2 hours, John worked 50 minutes and Henry worked 3 hours and 25 minutes, what was the total time involved?

7. If a mechanic uses 3/4 gallon of gas, 2/3 gallon, and 1/2 gallon, what is the total amount of gas used?

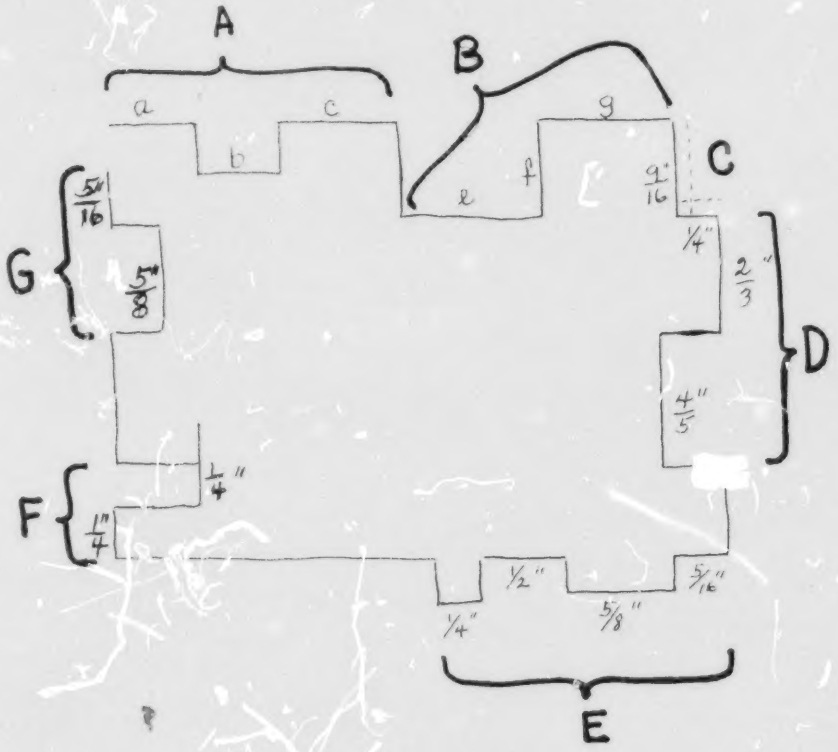
8. If a mechanic cuts a 2 1/2 inch, a 1 1/4 inch, and 3 3/4 inch dowl pin from a rod, what is the total length of the rod used?

9. If John spends 1/4 hours between home and the work shop, works 7 1/2 hours and returns home, what is the total time involved?

10. What length U-bolt will it take to mount a spring on an axle if the spring is 3 7/32 inches thick and the axle is 2 1/2 inches thick?

11. A garage owner has four pieces of vacuum hose of the following lengths: 8 3/4 feet, 9 1/4 feet, 47 1/2 feet, and 12 1/8 feet. How many feet of vacuum hose does he have in stock?

12. Measure to the nearest 16th of an inch the distance between each segment indicated by a small letter or fraction and add the length of the segments to get the total distance of the segment indicated by a capital letter.



A _____
a + b + c

B _____
e + f + g

C _____
9/16 + 1/4

D _____
2/3 + 4/5

E _____
5/16 + 5/8 + 1/2 + 3/8 + 1/4

F _____
1/4 + 1/4

G _____
5/8 + 5/16

13. The chassis of a truck is 14 3/4 feet long. Its body projects at the rear 4 1/2 feet beyond the end of the frame. If there is 3 3/4 feet clearance space at each end of the truck when it is in the garage, what is the inside length of the garage in feet?

14. In a car with a crossmember 1/8 inch thick and a frame 3/32 inch thick, how much stock is drilled to pierce both members?

15. A piece of hose, 1 7/8 inches inside diameter, has a wall thickness of 5/32 inch. What is the outside diameter?

16. What is the outside diameter of a washer with a 3/4 inch hole and 13/32 inch between the hole and outside edge?

17. A shaft 5/16 inch in diameter is to run in a bronze bushing with a wall thickness of 3/32 inch. What size hole is drilled for the bushing?

18. In rewiring the ignition of a car, a repairman uses the following lengths of high tension wire: 18 3/16",21 7/8", 18", 19 3/8", 24 7/32". What is the total length of wire used?

19. With journal lengths of 1 3/4 inches, 1 29/32 inches, and 1 57/64 inches, what is the total length of main bearing journals?

20. With a 5/32 inch gusset plate, a 11/64 inch frame member, and a 1/4 inch allowance for heading over, what is the length of rivet under the head?

1-8-3 Work sheet - Practical shop problems using subtraction

1. How much smaller is a 3/8" bolt than a 19/32" bolt?

2. Harry Jones has a 7/8" wrench and a 3/4" wrench. What is the difference in the sizes of the two wrenches?

3. If it takes 2 1/3 hours to overhaul the brakes on a truck and 1 1/4 hours to do the same job on a car, how much longer does it take to complete the truck?

4. A metal rod is 6 1/8" long. After cutting a piece 2 1/4" and another 2 5/16" from this piece, how long is the rod?

5. A piece of gasket material contained 64 3/8 sq. inches. A piece containing 31 3/64 sq. inches was cut from this piece. How much gasket material was left?

6. A can of cleaning fluid contained 7 7/8 gallons. After using 5 1/3 gallons, how much fluid was left?

7. Five bolts weight 5/8 oz. If three bolts were used, how much did the remaining two bolts weigh?

8. A roll of copper tubing was 48 1/2" long. A piece 12 7/8 inches long was cut off. How long was the remaining piece of tubing.

9. If the outside diameter of a hose is 2 1/4 inches and the wall is 13/32 inch thick, how large is the inside diameter?

10. The lockwasher used on a 3/8 inch bolt measures 25/64 inch inside diameter, and 5/8 inch outside diameter. What is the difference between the inside and the outside diameters?

11. What is the clearance between the lockwasher in problem 10 and the 3/8 inch diameter bolt?

12. If a piece of stock 6 3/4 inches long has a hole drilled with its center 2 5/6 inches from one end, how far is it from the center of the hole to the other end of the stock?

13. What is the length of the short end on an automobile leaf spring if the complete spring is 32 inches long and the long end is 18 3/8 inches?

14. A drum of grease complete with container weighs 420 1/2 pounds. What does the grease weigh if the container weighs 46 1/4 pounds?

15. A repairman works 1 1/4 hours on one car, 3 3/4 hours on another car, and 1 1/4 hours on a third car. How much time remains for another job in an 8 hour working day?

16. A truck has an overall length of 15 3/4 feet. How much clearance space is left in a garage 25 feet long inside, if a bench 2 1/4 feet wide is placed in front of the truck?

17. The top of the cab of a truck is 8 1/2 feet from the ground. The top of the body is 3 3/4 feet above the cab. What clearance is there in going under a bridge that has a clearance of 13 3/4 feet?

18. A garageman uses a 7 1/2 horsepower electric motor to run his air pump and machine shop. If his machine shop requires 4 1/2 horsepower and the air pump requires 3/4 horsepower, what amount of power is still available for other uses?

1-9-1 Work sheet - Multiplication of fractions

Work the following problems and write answers in the simplest form.

1. 4 x 1/2 =
2. 6 x 3/4 =
3. 5 x 1/2 =
4. 1/2 x 3 =
5. 2 x 7/8 =
6. 4 x 1/16 =
7. 3/32 x 8 =
8. 9/16 x 8 =
9. 7/32 x 10 =
10. 15/16 x 4 =

1-10-1 Work sheet - Fraction times a fraction using steel rule

1. Multiply the following fractions by using the steel rule, express answers in the lowest terms.

a. 1/2 of 15/64 =

b. 1/4 of 1/4 =

c. 1/2 of 1/2 =

d. 1/4 of 5/8 =

e. 1/8 of 1/2 =

f. 1/8 of 3/8 =

g. 1/2 of 5/8 =

h. 3/4 x 15/16 =

i. 1/4 x 8/64 =

j. 1/8 of 32/64 =

k. 15/32 of 1/2 =

l. 1/16 of 3/4 =

m. 1/2 of 5/16 =

n. 3/4 of 20/16 =

o. 1/2 of 15/8 =

1-11-1 Work sheet - Fraction times a mixed number

1. Multiply the following:

a. 1/4 x 2 3/4 =

b. 5/8 x 2 3/4 =

c. 2 7/8 x 5/6 =

d. 9/16 x 4 5/6 =

e. 2 5/12 x 2/1 =

f. 5 3/9 x 7/8 =

g. 2/5 x 1 7/20 =

h. 5 3/5 x 7/8 =

i. 7/8 x 2 1/7 =

j. 2/3 x 1/4 x 3 1/2 =

1-12-1 Work sheet - Mixed number times a mixed number

Multiply the following:

a. 1/14 x 2 1/4 =

b. 3 3/32 x 1 1/4 =

c. 21 1/3 x 41 1/4 =

d. 2 1/6 x 1 3/5 =

e. 5 1/3 x 6 1/4 =

f. 7 1/7 x 8 1/2 =

g. 1/8 x 1 3/8 =

h. 3 1/10 x 4 5/6 =

i. 1 7/8 x 1 5/8 =

j. 2 1/16 x 1 1/8 =

k. 4 1/9 x 5 3/5 =

l. 8 3/8 x 4 7/8 =

m. 10 1/2 x 12 1/3 =

n. 155 x 1 1/5 =

o. 179 1/8 x 137 3/4=

1-13-1 Work sheet - Practical applications

1. How thick would 4 sheets of metal 3/16th of an inch thick be when stacked on each other?

2. A gasoline tank holds 16 gallons of gas. If it is 1/4 full, how much gas is in the tank?

3. If a gasoline tank holds 20 gallons of gas and is 3/4 full, how many gallons are in the tank?

4. If Joe was making $3 an hour and worked 3/4 of one hour, how much money should he receive?

5. John made $30 for an 8 hour day. How much should he get paid for a 7 hour day?

6. John has a bolt 3/4 of an inch long. If he wishes to make a bolt 1/2 this length, how long will he made the bolt?

7. If a mechanic has 3/4 yard of gasket material and he uses 1/3 of the material for making a head gasket, what part of a yard did it take to make the gasket?

8. If a steel rod weighs 3/4 of a pound and is cut into pins that weigh 1/16 of this amount, how much does each pin weigh?

9. A certain job required 5 lengths of rubber tubing, each length being 2 5/8" long. How much rubber tubing is needed to complete this job?

10. The boys in a shop class are framing six prints. If each print requires 2 1/4 ft. of molding, what is the total amount of molding needed?

11. The fuel tank of a large truck holds 24 gallons of gasoline. If 1/8 of a tankfull of gasoline is used each hour, how many gallons will be used in 3 1/2 hours?

12. Mr. Smith works in a shop that pays overtime. This means that each hour of overtime is counted as 1 1/2 hours of regular time. During one week Mr. Smith worked 13 hours overtime. How many hours would this amount be as regular time?

13. How many pounds of grease are there in a barrel which holds approximately 54 gallons? (Use 7 7/8 pounds per gallon.)

14. A repairman cut 12 pieces of copper tubing from a coil. Each piece is 37 7/16 inches long. What is the total length used?

15. How many feet of power steering return hose is needed to replace the hose on eight units if each unit requires 9 3/4 inches?

16. Five lengths of radiator hose, each 2 7/8 inches long, are cut from a piece of hose 24 1/2 inches long. How much hose is left in the piece?

17. A channel iron crossmember weighs 2 1/2 pounds per foot. What is the weight of five equal crossmembers each 2 1/2 feet long?

18. Twelve 7/16 inch diameter holes are drilled in a straight line leaving 3/4 inch between the edges of the holes and at each end. What length piece is necessary?

1-14-1 Work sheet

Rewrite as multiplication

1. 16 ÷ 1/4 =
2. 6 ÷ 3/4 =
3. 8 ÷ 7/8 =
4. 2/3 ÷ 2 =
5. 15/16 ÷ 4 =
6. 11/32 ÷ 2 =
7. 1/2 ÷ 3/8 =
8. 2/5 ÷ 7/8 =
9. 3/4 ÷ 2/3 =
10. 1 3/2 ÷ 2 3/32 =
11. 2 2/5 ÷ 6 =
12. 6 3/4 ÷ 9 =
13. 12 ÷ 4 1/2 =
14. 16 ÷ 2 3/4 =

1-14-2 Work sheet

Solve the problems in 1-14-1

1-14-6 Work sheet - Written problems involving division of fractions

1. How many 2 1/2 ft. waterhose can be cut from a 10 ft. hose?

2. If 2/3 of an hour is the average time for greasing a car, how many cars can be greased in an 8 hour day?

3. If the spark plugs are cleaned on twenty-one cars in 5 1/4 hours, what is the average time spent on each car?

4. A certain size copper tubing weighs 1/3 pound per foot. How many feet are there in a roll weighing 20 1/2 pounds?

5. A garage buys a fifty foot roll of 5/8 inch heater hose. How many cars can be repaired if 12 1/2 feet of hose are required for each car?

6. An automobile jack raises the car 3/16 inch for each stroke of the lever. How many strokes of the lever are required to lift the car 3 3/4 inches?

7. A garageman has an oil barrel that contains 53 3/4 gallons. If his sales average 10 3/4 gallons a day, how many days will the oil last?

8. How many 4 7/8 inch lengths of radiator hose can be cut from a 3 foot piece of 1 7/16 inch hose?

9. How many pieces of safety wire 1 5/16 inches long can be cut from a piece 13 1/8 inches long?

10. A lot of bushings costs $4.00. If the price per bushing is $.04½, how many bushings are in the lot?

11. If 9 2/3 yards of gasket material cost $19.00, how much does it cost per yard?

12. If 7 3/4 dozen of small fittings cost $7.00, what is the cost per dozen?

13. A lot of bolts costs $5.25. At $.05¼ each, how many bolts are there in the lot?

14. If a mechanic is paid $20.00 for 4 3/4 hours of work, what is the hourly rate?

15. A customer drives his car 103 miles and uses 5 3/4 gallons of gas. How many miles does he average per gallon of gas?

1-15-2 Work sheet - Power Mechanics problems with fractions

1. Measure the following to the nearest 16th of an inch and find the total length.

   _____ + _____ + _____ =

2. Name the next largest size wrench in 16th of an inch.

   a. 1/2 _____ b. 7/8 _____ c. 11/16 _____ d. 5/16 _____

3. In the above problem name the size of the wrench that is smaller than the wrench to the nearest 16th inch.

   a. b. c. d.

4. A piece of copper tubing 3 5/8" long was cut from a piece 6 1/2" long. How long was the remaining piece of tubing?

5. Smith worked 2½ hours repairing brakes, 1 3/4 hours tuning the motor and 1/2 hour balancing the wheels of a car. What was his total labor on this car?

6. What length rubber hose is needed to cut 6 pieces of hose 4 3/8" long?

7. If Joe worked 3¼ hours at $2 an hour, how much would his pay be?

8. How high should a box be to enclose 5 sheets of metal 3/8 of an inch thick?

9. If 1/5 yard of material is used to make one mechanic's wash towel, how many towels can be made from 4/5 yard of material?

10. How many strips of brass 5/16" thick will be needed to build up a piece for a motor to a thickness of 1 9/16 inch.

11. How many shims 3 7/8 inches long can be made from 20 shim strips each 3 feet long?

12. If 9 holes are drilled in a straight line with a center to center distance of 1 15/32 inches and 2 5/8 inches allowed between each end and the center of the end holes, what length piece is necessary?

13. An auto averages 45 5/10 miles per hour on a trip. How far does it go in 7 3/4 hours?

14. A truck hauls in one day three loads of stone of the following weights: 3¼ tons, 4 1/8 tons, and 3½ tons. What is the total tonnage carried during that day?

15. If the lockwasher used on a 3/4 inch bolt measures 25/32 inch inside diameter, and the ring is 3/16 inch in width, what is the outside diameter?

INSTRUCTIONAL MATERIALS

LIST OF MATERIALS

1-0-0 Unit Fractions
- 1-1-0 Teaching meaning of fractions
  Steel rule, Merrill Skilltape, tape player, filmstrip, filmstrip projector
  - 1-1-1 Steel rule
  - 1-1-2 Cyclo-teacher
  - 1-1-3 Merrill Skilltape, tape player
  - 1-1-4 Work sheet
- 1-2-0 Equivalent fractions
  - 1-2-1 Steel rule, bolts, nuts
  - 1-2-2 Steel rule, cylinder
  - 1-2-3 Work sheet on equivalent fractions
  - 1-2-4 Work sheet
- 1-3-0 Arranging fractions in sequence
  - 1-3-1 Several sets of sockets, open end, and boxed end wrenches
  - 1-3-2 Several various size bolts, nuts, sockets, open and boxed end wrenches
  - 1-3-3 Several sets of Allen wrenches
  - 1-3-4 Allen wrenches, sets of hollow head set screws
  - 1-3-5 Work sheet
- 1-4-0 Teaching fractions not on steel rule
  - 1-4-1 Cassette tape, and work sheet
- 1-5-0 Addition of fractions
  - 1-5-1 Steel rule, overhead projector
  - 1-5-2 Steel rule, pieces of hose and tubing
  - 1-5-3 Steel rule - Work sheet
- 1-6-0 Cassette tape, programmed material
  - 1-6-1 Cassette tape, work sheet, cassette player
  - 1-6-2 Cyclo-teacher
  - 1-6-3 Work sheet
- 1-7-0 Subtraction of fractions
  - 1-7-1 Steel rule, transparencies, overhead projector
  - 1-7-2 Steel rule, work sheet
  - 1-7-3 Steel rule, work sheet
- 1-8-0 Subtraction of mixed numbers
  - 1-8-1 Cassette tape, cassette player, work sheet
  - 1-8-2 Cyclo-teacher
  - 1-8-3 Work sheet
- 1-9-0 Multiplication of fractions
  - 1-9-1 Transparencies, overhead projector, and steel rule
  - 1-9-2 Cyclo-teacher
  - 1-9-3 Verbal problems
- 1-10-0 Multiplication of a fraction times a fraction.
  - 1-10-1 Work sheet
  - 1-10-2 Cyclo-teacher M-76
  - 1-10-3 Word problems

1-11-0 Transparencies, overhead projector, steel rule
  1-11-1 Work sheet
  1-11-2 Cuclo-teacher M-76
  1-11-3 Work sheet
1-12-0 Transparencies, overhead projector, chalk board
  1-12-1 Work sheet
  1-12-2 Cyclo-teacher M-76
1-13-0 Practical problems related to multiplication of fractions
  1-13-1 Work sheet
1-14-0 Division of fractions
  1-14-1 Work sheet
  1-14-2 Cyclo-teacher M-78
  1-14-3 Cassette tape, tape player
  1-14-4 Filmstrip, filmstrip projector
  1-14-5 Work sheet
1-15-0 Practical problems involving fractions
  1-15-1 Work sheet
1-16-0 Evaluation
  1-16-1 Evaluative material

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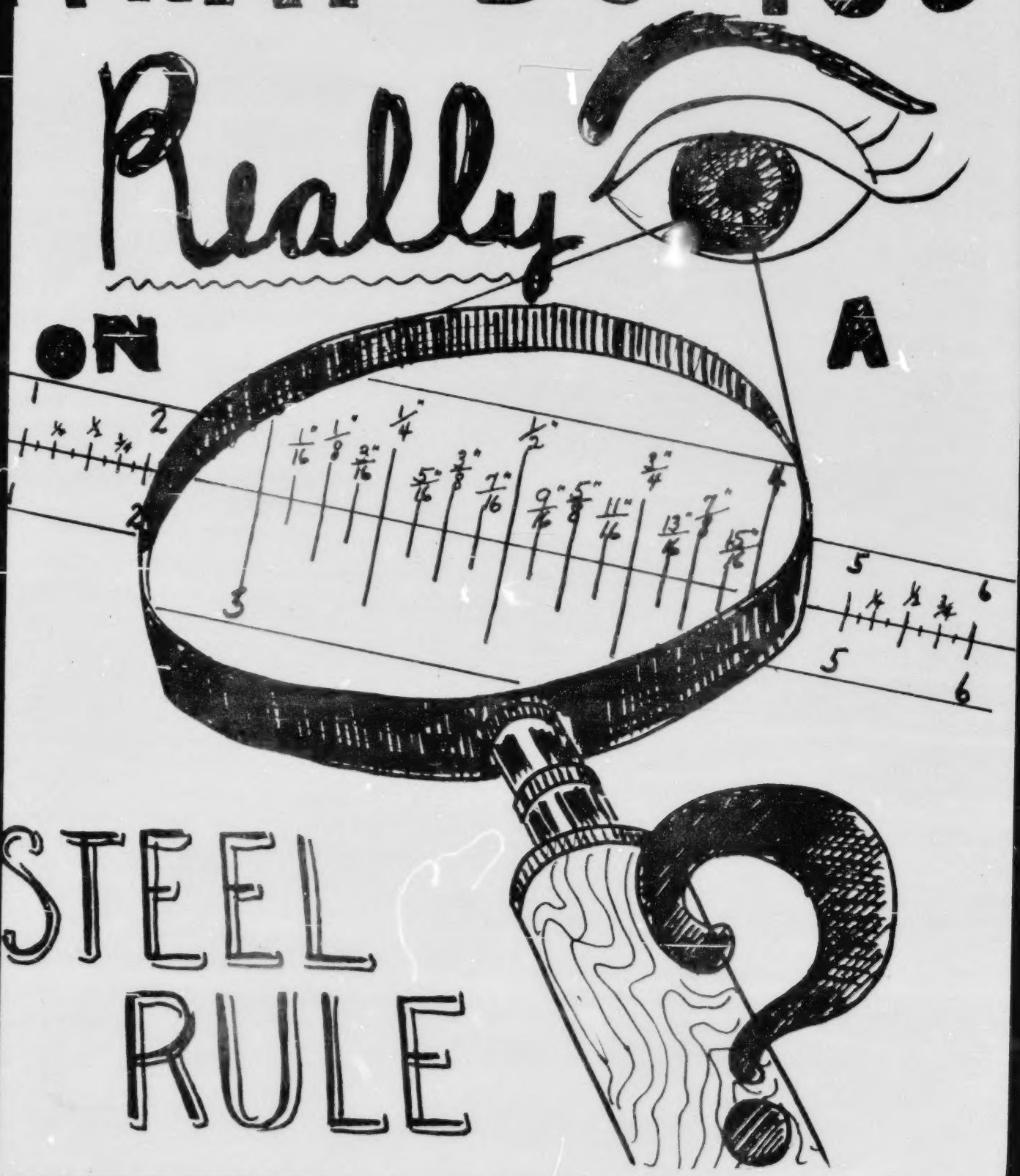
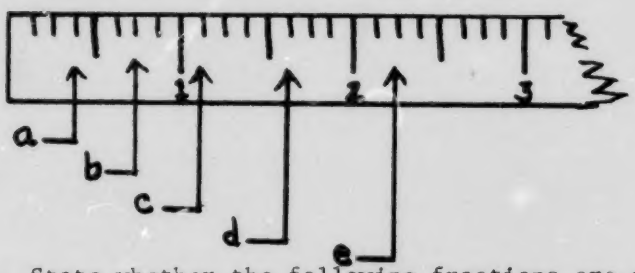
WHAT DO YOU Really SEE ON A STEEL RULE?



EVALUATION MATERIAL

I. Indicate the correct fraction in its lowest form.

1. Steel rule



a. _____

b. _____

c. _____

d. _____

e. _____

2. State whether the following fractions are proper, improper or mixed.

a. 1/3 _____

b. 5/3 _____

c. 7/8 _____

d. 4 6/7 _____

e. 9/2 _____

3. In the fraction 4/5, four is the (a)_____ and 5 is the (b) _____.

4. a. Five inches is what part of a foot? _____

b. 45 min. is what part of an hour? _____

c. 6 days are what part of a week? _____

II.

1. Complete the following:

a. $1/2 = \frac{\quad}{6}$

b. $2/5 = \frac{\quad}{25}$

c. $8/64 = \frac{\quad}{8}$

d. $4/32 = \frac{\quad}{8}$

e. $4/5 = \frac{16}{\quad}$

3. Reduce the following fractions to lowest terms:

a. 6/9 _____ d. 9/27 _____

b. 12/48 _____ e. 14/16 _____

c. 16/6 _____

4. Arrange in order from least to greatest

a. 1/2, 7/16, 3/8, 9/16

b. 9/10, 5/6, 4/5, 2/3

III 1. On a steel rule, add the following fractions:

a. 1/4 + 1/4 = _____

b. 3/8 + 5/8 = _____

c. 3/8 + 3/16 = _____

d. 2 1/4 + 1 5/16 = _____

e. 3/8 + 1/16 + 3/4 = _____

2. Add the following:

a. 1/3 + 4/9

b. 2 3/5 + 4 3/8

c. 16 7/8 + 13 1/3

d. 21 2/3 + 14 5/7

e. 11 1/3 + 3 1/5 + 12 5/6

IV. 1. Subtract with use of a steel rule and express the answer in lowest terms:

a. 5/8 - 1/4 = _____ d. 3 1/4 - 2 3/4 = _____

b. 3/4 - 3/16 = _____ e. 2 9/32 - 15/16 = _____

c. 2 7/8 - 1 3/16 = _____

2. Subtract and reduce the answers to the lowest terms.

a. 7/8 - 1/4

b. 4 2/3 - 2 1/5

c. 16 1/3 - 9 3/5

d. 11 3/8 - 6 1/4

e. 17 4/5 - 8 5/6

V. Multiply the following:

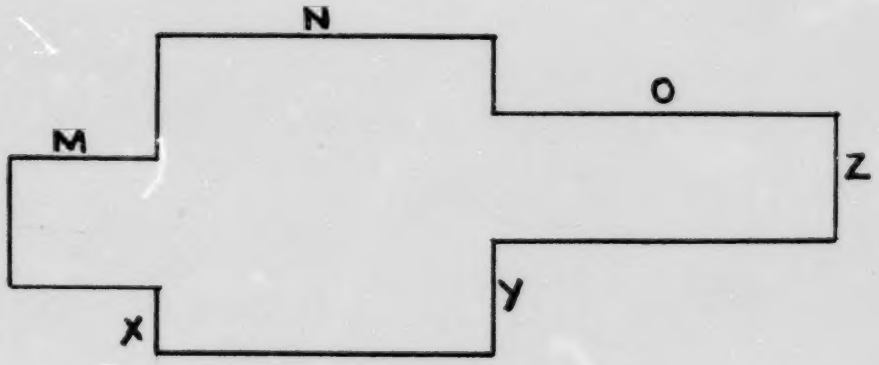
1. 3/8 x 16 =
2. 5/16 x 8 =
3. 14 x 3/7 =
4. 11 x 4/5 =
5. 12 x 3 2/3 =
6. 3/4 x 8/9 =
7. 1/3 x 9/1 =
8. 1/4 x 2/5 =
9. 7/8 x 3/4 =
10. 1/2 x 5/8 =
11. 1/8 x 16/32 =
12. 2 1/16 x 3/4 =
13. 2 5/12 x 3/16 =
14. 2 3/4 x 3 1/7 =
15. 1/3 x 2 1/2 x 3/4 =

VI. Divide the following fractions:

1. 5 ÷ 1/5 =
2. 2/3 ÷ 3 =
3. 1/2 ÷ 3/8 =
4. 2/3 ÷ 3/4 =
5. 3/8 ÷ 1/2 =
6. 4/5 ÷ 5 =
7. 4/5 ÷ 1/5 =
8. 1 2/3 ÷ 2 3/32 =
9. 14 ÷ 2 1/2 =
10. 6 ÷ 5/6 =
11. 2/5 ÷ 6/7 =
12. 4 1/3 ÷ 5/7 =
13. 3 1/2 ÷ 2 1/3 =
14. 9 4/7 ÷ 3 2/3 =
15. 19 2/3 ÷ 1/3 =

VII. Solve the following written problems:

1. Measure and give the length of M + N + O to the nearest 16th of an inch. Find the distance of X, Y, and Z.



2. If the outside diameter of a hose is 2½ inches and the hose is 9/32 inch thick, how large is the inside diameter of the hose?

3. If a car averages 12½ miles to a gallon, how far can you go on 14 gallons?

4. If it takes 2/3 of an hour to wash and clean a car, how many cars can you wash and clean in 8 hours?

5. John drove his car 120 miles on 6 3/4 gallons of gasoline. How many miles per gallon did he get on the trip?

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 2

DECIMALS

DECIMALS

2-0-0 At the end of this topic, students will demonstrate a basic knowledge (1,2,3) of decimals and their application to power mechanics by scoring 70% or above on a teacher made test.

2-1-0 The project teacher will use a place value chart with overhead projector and cassettes to change fractions to decimals and to change decimals to fractions.

- 2-1-1 Work sheet changing fractions to decimals
- 2-1-2 Merrill Skilltape (Understanding Decimals A & B)
- 2-1-3 Cyclo-Teacher M-81
- 2-1-4 Work sheet changing decimals to fractions

2-2-0 The project teacher will use a micrometer and feeler gauge to compare decimals.

- 2-2-1 Arrange a set of feeler gauges in order from least to greatest.
- 2-2-2 Measure and record size of feeler gauge by use of micrometers.
- 2-2-3 Work sheet comparing decimals using >, < and =.
- 2-2-4 Work sheet on comparing decimals.

2-3-0 By use of programmed materials, the project teacher will give a basic understanding of adding and subtracting decimals.

- 2-3-1 Merrill Skilltape (Operations with Decimals - A)
- 2-3-2 Filmstrips

2-4-0 By use of overhead projector and teacher constructed work sheet, the project teacher will further reinforce the ability of the students to add and subtract decimals.

- 2-4-1 Lecture, with students participating, using overhead projector.
- 2-4-2 Work sheet with addition and subtraction exercises pertaining to power mechanics

2-5-0 By use of programmed materials, the project teacher will give a basic understanding of multiplying decimals.

- 2-5-1 Cyclo-Teacher M-85
- 2-5-2 Merrill Skilltapes (Operation with Decimals B)
- 2-5-3 Filmstrips
- 2-5-4 Work sheet - Multiplying Decimals

2-6-0 By use of overhead projector, the project teacher will introduce the concept of multiplying a decimal by 10, 100, 1000 and .1, .01, and .001.

- 2-6-1 Work sheet - Multiplying Decimals by Powers of 10

2-7-0 By use of programmed materials, the project teacher will give a basic understanding of dividing decimals.

2-7-1 Cyclo-Teacher M-87 - M-88
2-7-2 Merrill Skilltapes (Operation with Decimals - B)
2-7-3 Filmstrips
2-7-4 Work sheet - Dividing Decimals

2-8-0 By use of overhead projector, the project teacher will introduce the concept of dividing a decimal by 10, 100, 1000 and .1, .01, and .001.

2-8-1 Work sheet - Dividing by Powers of 10

2-9-0 The project teacher will use chalk board and overhead projector to analyze and solve decimal problems related to power mechanics.

2-9-1 Group work, writing and solving problems
2-9-2 Group activity - Work sheet on written problems

2-10-0 The project teacher will administer a teacher-made test on decimals.

2-10-1 Teacher-made test

ACTIVITIES

2-1-1 Work sheet - Changing Fractions to Decimals

A. Fractions with denominators of 10, 100 and 1000 can be changed to decimals as follows:

7/10 = .7, 63/100 = .63, 191/1000 = .191, 7/100 = .07, 91/1000 = .091,

7/1000 = .007.

Change the following to decimals:

1. 3/10
2. 17/100
3. 35/100
4. 5/10
5. 15/100
6. 125/1000
7. 8/100
8. 25/1000
9. 40/100
10. 40/1000
11. 9/10
12. 9/100
13. 9/10000
14. 27/1000
15. 32/1000
16. 247/1000
17. 6/100
18. 6/10
19. 6/1000
20. 92/100

B. All fractions can be changed to decimals by dividing the denominator into the numerator.

EXAMPLE: 3/4

$$4\overline{)3.00} = 0.75$$

$$\begin{array}{r} 28 \\ \hline 20 \\ 20 \\ \hline \end{array}$$

$\therefore$ 3/4 = .75

Change the following to decimals:

1. 1/2
2. 4/5
3. 7/8
4. 1/4
5. 3/8
6. 9/16
7. 5/8
8. 7/10
9. 4/25
10. 14/25
11. 3/50
12. 3/16
13. 3/32
14. 6/8
15. 7/20

C. Some decimals will not come out even.

EXAMPLE: 1/3

$$3\overline{)1.0000} = .3333\ldots$$

$$\begin{array}{r} 9 \\ \hline 10 \\ 9 \\ \hline 10 \\ 9 \\ \hline 10 \end{array}$$

These are called repeating decimals. Round off the following to the nearest thousandths:

EXAMPLE: 1/6

$$6\overline{)1.0000} = .1666 = .167$$

$$\begin{array}{r} 6 \\ \hline 40 \\ 36 \\ \hline 40 \\ 36 \\ \hline 40 \\ 36 \\ \hline 4 \end{array}$$

Change these fractions to decimals to the nearest thousandth. If the remainder is equal to or greater than 1/2 the divisor, increase the last digit by one.

1. 2/3
2. 1/6
3. 1/12
4. 11/12
5. 2/15
6. 4/7
7. 7/15
8. 5/6
9. 1/9
10. 1/7

D. A shortcut for changing some fractions to decimals is as follows:

$$\frac{3}{25} \cdot \frac{4}{4} = \frac{12}{100} = .12$$

3/25 = 3/25 · 4/4 = 12/100 = .12

$$\frac{3}{5} \cdot \frac{2}{2} = \frac{6}{10} = .6$$

3/5 · 2.2 = 6/10 = .6

Solve the following in this manner.

1. 1/25
2. 4/50
3. 4/5
4. 7/25
5. 4/500
6. 12/25
7. 1/4
8. 3/5
9. 35/50
10. 3/500

2-1-4 Work sheet - Changing Decimals to Fractions

All decimals can easily be changed to fractions in the following manner:

.25 = 25/100 = 1/4

7.025 = 7 25/1000 = 7 1/40

Change the following decimals to fractions and reduce to lowest terms:

1. .9
2. .75
3. .8
4. .625
5. .80
6. .3725
7. .050
8. .005
9. .500
10. .076
11. 16.7
12. 1.675
13. 25.025
14. .0008
15. 19.775

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2-4-2 Work sheet - Addition and Subtraction of Decimals as Related to Power Mechanics

Solve the following problems:

(a) .1 + .2 = _____

(b) .3 + .8 = _____

(c) .03 + .04 = _____

(d) .05 + .3 = _____

(e) .025 + .210 = _____

(f) 1.4 + 3.5 = _____

(g) 1.15 + 3.04 = _____

(h) 15.4 + 2.025 = _____

(i) .0141 + .14 = _____

(j) .0016 + 1.014 = _____

(k) .5 - .2 = _____

(l) .8 - .04 = _____

(m) .06 - .01 = _____

(n) .682 - .25 = _____

(o) 1.694 - .049 = _____

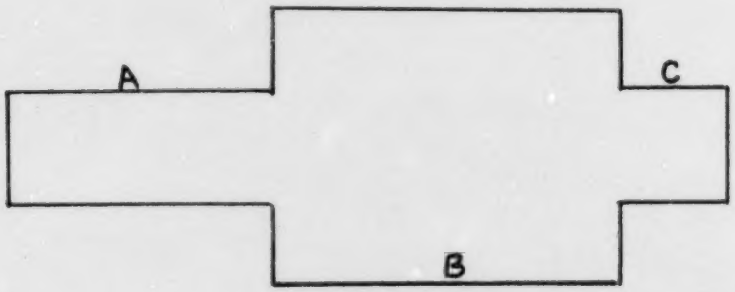
(p) 22.15 - 9.34 = _____

(q) 9.0616 - .9241 = _____

(r) 4.005 - .123 = _____

(s) .0796 - .0776 = _____

(t) 5.004 - 2.135 = _____



1. In the diagram above A = 1.015", B = 1.6925" and C = .625". What is the total length of the shaft?

2. An aluminum piston expands .0055 inch in diameter when heated. What is its size after expansion, if its standard size is 3.1875 inches in diameter?

3. What is the total amount of a bill itemized as follows: Compressor seal $6.45, refrigerant $5.50, clutch brush set $2.70, dye trace solution $2.25, and labor $16.85?

4. Five thousandths of an inch are to be ground out of a bore that measures three and eight hundred seventy-five thousandths inches. What will be the reground size, stating answer numerically?

5. The standard size of a certain piston is .625 inch, the oversize is .005 inch greater; what is the actual size?

6. How much must be cut from a shackle bushing measuring 2.375 inches in length to fit a spring 2.125 inches wide?

7. Two pistons have diameters of 2.8125 inches and 2.875 inches, respectively. What is the difference in their diameters?

8. A customer is charged $4.60 for labor and $2.21 for parts for a repair job done on his car. When paying this bill what change should he receive from a ten dollar bill?

9. The difference in the size of a new 3.375 inch piston and a worn one is .0185 inch. What is the size of the old piston?

10. A .0015 inch feeler gauge is placed between the cylinder wall and the piston. If the cylinder bore is 3.5 inches, what is the diameter of the piston?

2-5-4 Work sheet - Multiplying Decimals

Multiply the following:

1.	.4	8	24	8.5	144
	3	.9	.7	.3	.9
2.	.13	.29	4.14	.175	.0104
	7	75	7	911	55
3.	.5	.39	.1	.925	8.94
	.4	.8	.08	.9	.8
4.	.46	.01	.068	.006	12.85
	.54	.01	.75	.02	.006
5.	.3947	1.0946	.6214	6.4517	4.875
	.9	3.05	.95	800.9	4.743

6. If a machine screw has 12 threads and the pitch is .0625 inch, how long is the screw under the head?

7. A set of alternator brushes costs $.65. What will a dozen sets of brushes cost?

8. If the cost of gasoline is $.359 per gallon, what will 472 gallons cost?

9. In a 6-cylinder car, the piston displacement of one cylinder is 36.82 cubic inches. What is the total piston displacement for the motor of this car?

10. What is the weight of 25.75 gallons of gasoline if one gallon weighs 6.56 pounds?

2-6-1 Work sheet - Multiplying Decimals by 10, 100, 1000, .1, .01, and .001

Multiplication of any decimal by a power of 10 can be accomplished simply by moving the decimal the correct number of places to the right or left.

EXAMPLE:

.4231 x 10 = 4.231	.452 x .1 = .0452
56.752 x 100 = 5675.2	.5 x .01 = .005
.00062 x 1000 = .62	235.4 x .001 = .2354

Multiply the following:

1. .35 x 10
2. .005 x 100
3. .511 x 1000
4. .625 x .1
5. 72.35 x .01
6. 625 x .001
7. .00023 x 1000
8. 231.3 x .01
9. 10 x 2.53
10. .001 x 45.3
11. 100 x .00425
12. .1 x .125

2-7-4 Work sheet - Dividing decimals

A. To divide a decimal by a whole number, divide as in regular division and place the decimal above where it is located in the dividend.

Example:

$$\begin{array}{r} 2.11 \\ 25\overline{)\,52.75} \\ \underline{50} \\ 27 \\ \underline{25} \\ 25 \\ \underline{25} \end{array}$$

Divide the following:

1. $3\overline{)\,6.3}$
2. $6\overline{)\,.852}$
3. $8\overline{)\,.0056}$
4. $38\overline{)\,.266}$
5. $25\overline{)\,72.5}$
6. $48\overline{)\,36.00}$
7. $7\overline{)\,6.013}$
8. $20\overline{)\,.0440}$
9. $70\overline{)\,49.98}$
10. $125\overline{)\,5.125}$

B. To divide by a decimal, first move the decimal in the divisor to the right of the numeral. Next move the decimal in the dividend the same number of places to the right that you did in the divisor.

Example:

$$\begin{array}{r} 8.1 \\ 7\overline{)\,56.7} \\ \underline{56} \\ 7 \\ \underline{7} \end{array}$$

$$\begin{array}{r} 100. \\ .008\overline{)\,.800} \\ \underline{800} \end{array}$$

Divide the following:

1. $.18\overline{)\,.96}$
2. $.9\overline{)\,.63}$
3. $.8\overline{)\,37.6}$
4. $.5\overline{)\,.05}$
5. $.7\overline{)\,.056}$
6. $.06\overline{)\,.036}$
7. $.04\overline{)\,49.28}$
8. $.21\overline{)\,44.1}$
9. $.008\overline{)\,496}$
10. $.917\overline{)\,2.34752}$

C. Practical Applications:

1. One kind of sheet metal stock has a thickness of .0375 inch. How many sheets of the metal are there in a stack 15 inches high?

2. A shop had 150 pounds of bolts. If each bolt weighed .0625 pound, how many bolts were there?

3. A motorcycle traveled 95.2 miles in 1.4 hours. What was the average speed per hour?

4. If 15 gallons of gasoline weights 98.4 pounds, what does one gallon weigh?

5. The total displacement in an 8-cylinder engine is 383 cubic inches. What is the displacement for one cylinder to the nearest thousandth of a cubic inch?

2 -8-1 Work sheet - Division by 10, 100, 100, .1, .01, and .001

Solve the following by moving the decimal point to the correct position:

EXAMPLE: a) 47.8 ÷ 10 = 4.78
b) 47.8 ÷ .01 = 4780

1. 2,666 ÷ 100 =
2. 27.84 ÷ .001 =
3. 457.754 ÷ 10 =
4. 47.74 ÷ 100 =
5. 47.74 ÷ .1 =
6. 47.74 ÷ .01 =
7. .007 ÷ .01 =
8. 7,235 ÷ 1000 =
9. 456 ÷ .1 =
10. 927 ÷ 1000 =
11. 47.8 ÷ 10 =
12. 78.4 ÷ .01 =
13. 47 ÷ 100 =
14. .47 ÷ .01 =
15. 768.867 ÷ 1000 =

2-9-2 Work sheet - Decimal Fractions

1. What is the weight of the gasoline in a tank which holds 21.8 gallons, if one gallon weighs 6.56 lbs.? _____

2. A motor which has a standard bore of 3 3/16 inches is rebored to .050 inch oversize. What does the new bore measure? _____

3. The price charged a customer for having a car lubricated is $1.60. The operator receives $.65, and the cost of materials is $.28. What amount is left to cover overhead and profit? _____

4. If a profit of $.65 is made on each car lubricated, how many cars will have to be lubricated to earn a total of $5.20? _____

5. What is the total cost of the following articles: 4 grease guns @ $17.65 each, 25 lubricant fittings (straight) @ $.06 each, 45 lubricant fittings (45°) @ $.11 each, and 60 fittings (90°) @ $.16 each? _____

6. What is the micrometer reading for a piece of 7/8 inch diameter stock? _____

7. If the piston pin bosses are reamed .003 inch oversize, and the standard size pin is .750 inch, what size pin is needed to replace the old pin? _____

8. If the standard size hole for a piston pin is .750, what is the oversize, if a hole measures .911 inch? _____

9. If an automobile travels 836.2 miles on 45.2 gallons of gasoline, what is the average mileage per gallon? _____

10. If the pitch of a thread is .125 inch, how far is a nut moved in 6.5 turns? _____

11. A .0015 inch feeler gauge is placed between the cylinder wall and piston. If the cylinder bore is 3.5 inches, what is the diameter of the piston?

12. A hole for a piston pin, originally .8175 inch in diameter, has worn .0012 inch, what size is the hole? _____

13. The standard width of a certain piston ring is .1875 inch. The micrometer reading is .184 inch. How much is it worn? _____

14. If a piston pin cost $.18, what would five dozen cost? _____

15. What is the average speed in miles per hour of a car that is driven 340 miles in 7.75 hours? _____

16. If 12 pistons cost $49.60, what is the cost of one piston?_____

17. A piston pin wears a groove in a cylinder wall .012 inch deep on one side and .0075 inch on the other. What size is the cylinder rebored in order to clear up the bore if the original size was 3.125 inches?_____

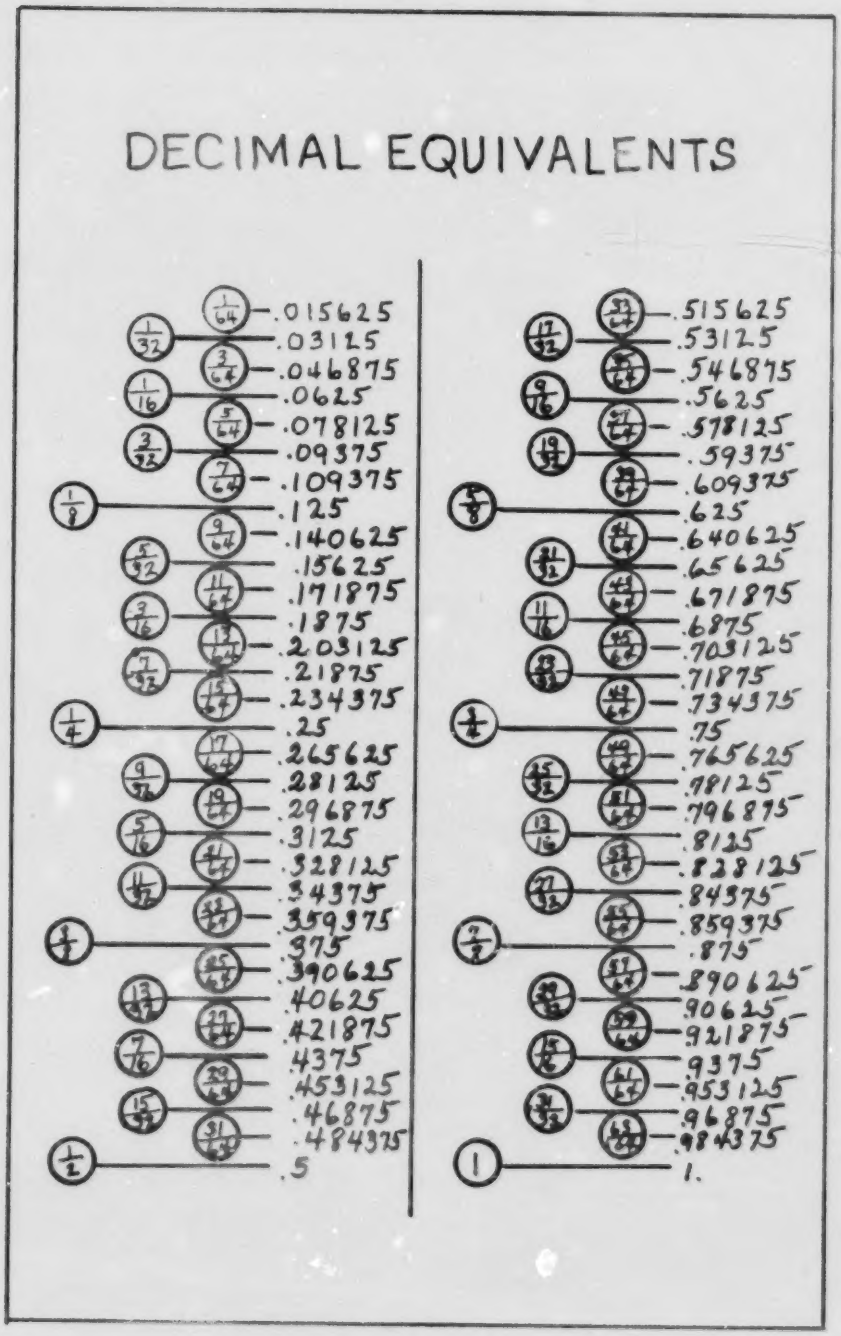
18. A cylinder bore originally measured three and six hundred eighty-seven thousandths, but was worn six thousandths of an inch. What is the greatest diameter of bore?_____

19. A generator commutator 2 inches in diameter is turned down on a lathe, the tool taking a cut .0625 inch deep. What is the finished diameter? _____

20. If a 6 cell storage battery shows an average voltage of 2.2 volts per cell, what is the voltage of the battery?_____

INSTRUCTIONAL MATERIALS

DECIMAL EQUIVALENTS OF AN INCH



2-10-1 Test - Evaluative Material - Decimals

Change the following fractions to decimals:

1. 6/10
2. 9/100
3. 15/10000
4. 1/1000
5. 1/4
6. 7/25
7. 9/50
8. 12/16
9. 5/16
10. 3/8
11. 1/5
12. 9/10
13. 3/20
14. 6/24

Change the following fractions to repeating decimals and round off correct to thousandths:

1. 1/3
2. 1/6
3. 1/15
4. 6/15
5. 3/7
6. 5/9

Fill in the blanks with a $>$, $<$, or = symbol to make the following statements true:

1. .30_____.3
2. .25_____.250
3. .251_____.30
4. .125_____.1
5. .001_____.0001
6. .12_____.120
7. .199_____.2
8. .004_____.014

Arrange the following decimals according to size, least to greatest:

1. .78, .078, .781, .0078

2. 9.06, .906, .096, 90.6

3. .4, .04, .004, .041

4. 5.89, .0989, .639, .6

5. .45, .453, .4502, .4498

Add the following:

1.
$$\begin{array}{r} 68.930 \\ 123.014 \\ \underline{321.485} \end{array}$$

2. 1.431 + 35.046 + 12.005

3. 4.056 + 2.7 + 3.52

4. 6.7 + 7.123 + 42.5862

5. $396.52 + $437.48 + $23.06

Subtract the following:

1.
$$\begin{array}{r} 67.095 \\ \underline{39.126} \end{array}$$

2.
$$\begin{array}{r} 135.111 \\ \underline{129.222} \end{array}$$

3. 87.6 - 35.44

4. 98.1 - 34.2

5. 75 - 36.9

Multiply the following:

1.
$$\begin{array}{r} 43.52 \\ \times\ 2.32 \end{array}$$

2.
$$\begin{array}{r} 61.7 \\ \times\ .233 \end{array}$$

3.
$$\begin{array}{r} 23.124 \\ \times\ .004 \end{array}$$

4.
$$\begin{array}{r} .1245 \\ \times\ .23 \end{array}$$

5.
$$\begin{array}{r} 671.983 \\ \times\ 100 \end{array}$$

Divide the following:

1. $4\overline{)6.4}$

2. 96 ÷ 8

3. 496/.008

4. $.007\overline{)4.9}$

5. $.7\overline{).0056}$

1. If a chassis frame of a car is .250 inch thick and the spring hanger is .050 inch thick, what length rivet will be needed to fasten the two pieces together if .010 is allowed for the rivet head?_____

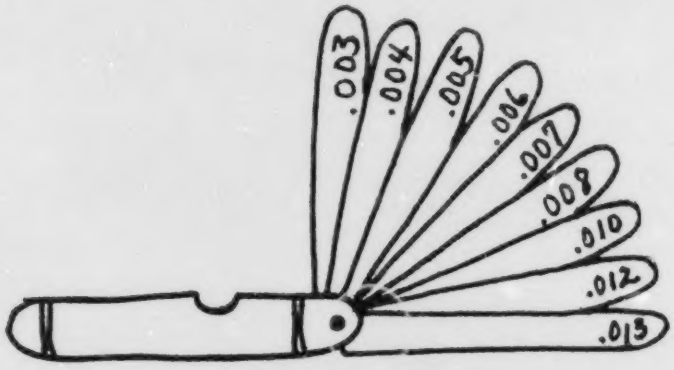
2. If .125 inch is removed from a pin with a diameter 2.013 inches, what is the new diameter?_____

3. If a boring tool removes .015 inch from a cylinder each cut, how many cuts will it have to make in order to remove .060 inch?_____

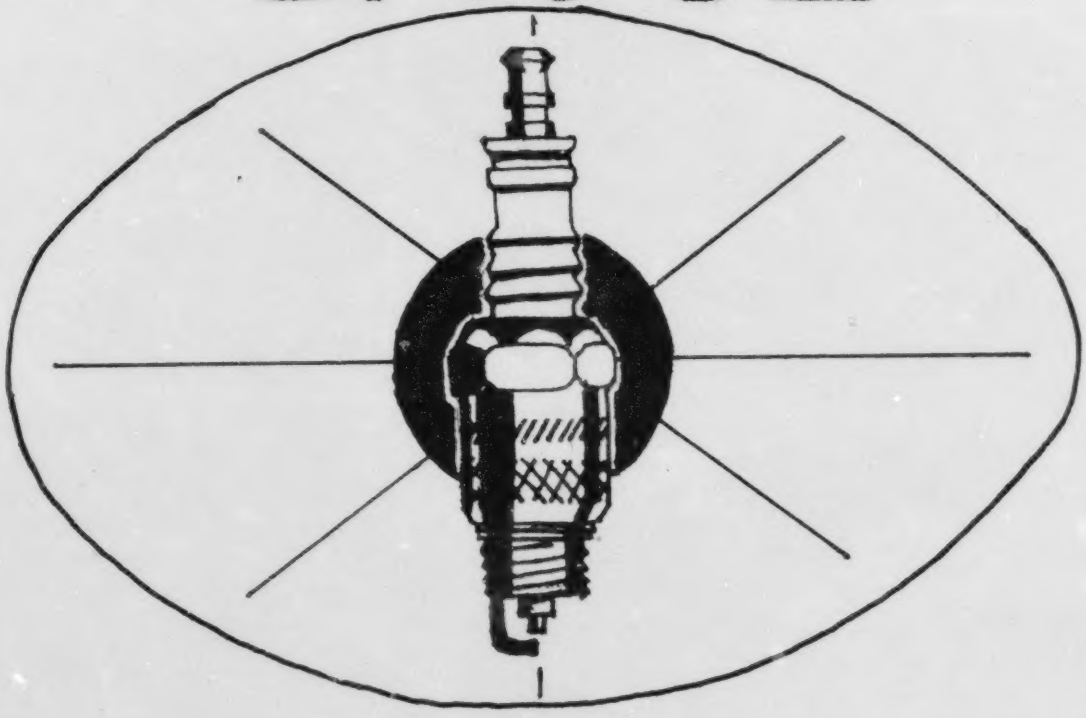
4. What is the cost of 1/2 dozen piston pins if they are priced at $5.65 a dozen?_____

5. What is the net cost of the following order.
   15 piston pins @ $.12 each_____
   12 straight lubricant fittings @ $.08 each_____
   4 axles @ $9.45 each_____
   2-15" wheels @ $9.20 each_____

How can a Feeler



GAUGE

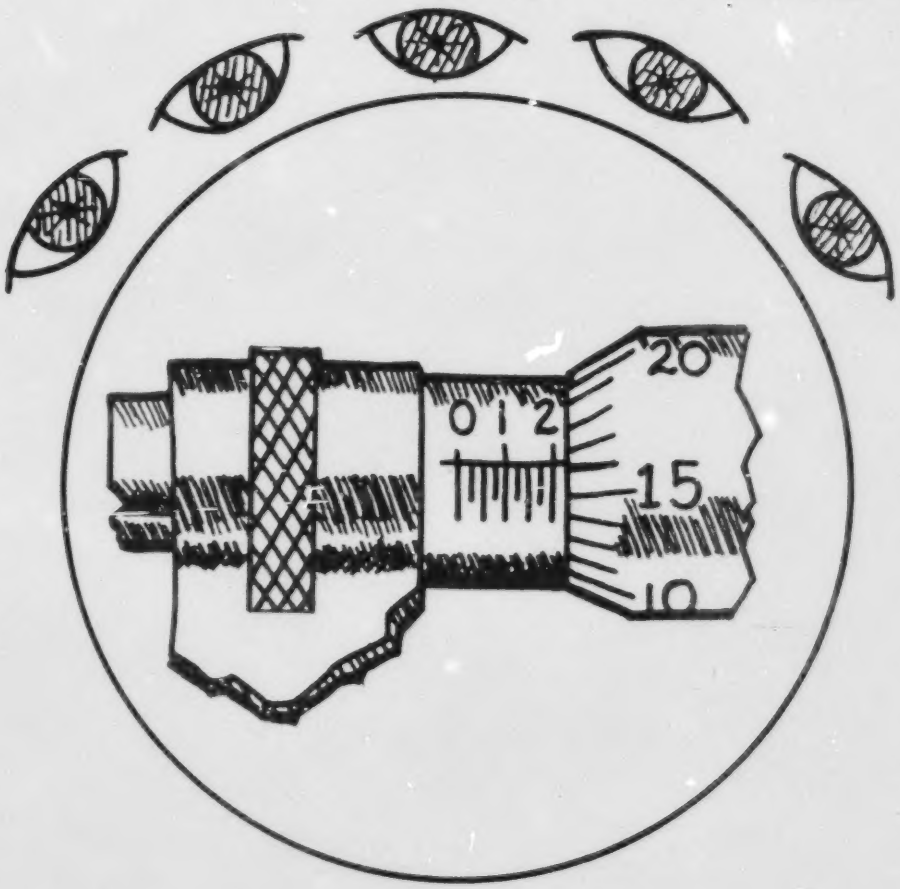


HELP HERE?

A Micrometer **SEES** Measurements

TOO SMALL

TO BE SEEN BY



What Measurement

is Seen Here?

MATERIALS

2-0-0 Supplies needed to teach decimal fractions.

2-1-0 Place value chart, overhead projector, cassette tape, cassette player

2-1-1 Work sheet n/10, n/100, etc.
2-1-2 Merrill Skilltape, cassette player
2-1-3 Cyclo-Teacher M-81

2-2-0 Micrometer, feeler gauge

2-2-1 Several sets of feeler gauges
2-2-2 Several sets of feeler gauges, and several micrometers
2-2-3 Work sheet using $<$, $>$ and =
2-2-4 Work sheet on comparing decimals

2-3-0 Adding and subtracting fractions

2-3-1 Merrill Skilltape, cassette player
2-3-2 Filmstrips, filmstrip projector

2-4-0 Overhead projector, teacher work sheet

2-4-1 Overhead projector
2-4-2 Work sheet, adding decimals

2-5-0 Programmed materials

2-5-1 Cyclo-Teacher
2-5-2 Merrill Skilltapes, cassette player
2-5-3 Filmstrips, filmstrip projector
2-5-4 Work sheet, Multiplying decimals

2-7-0 Programmed materials

2-7-1 Cyclo-Teacher M-87, M-88
2-7-2 Merrill Skilltape, Cassette player
2-7-3 Filmstrip, filmstrip projector
2-7-4 Work sheet, Dividing decimals

2-9-0 Chalk board, overhead projector

2-9-1 Teacher constructed problems
2-9-2 Work sheet, written problems

2-10-1 Test

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 3

PER CENT

PER CENTS

3-0-0 Upon completion of this topic the students will show a basic understanding of percentage, and how percentage problems may be applied to power mechanics, as evidenced by scoring 70% or more on a teacher made test.

3-1-0 The project teacher will use Wollensak tapes, filmstrips and lecture to introduce the concept of percentage.

- 3-1-1 Lecture on use of percents in power mechanics
- 3-1-2 Wollensak tapes #C-3151
- 3-1-3 Filmstrips

3-2-0 The project teacher will use Wollensak tapes, Cyclo-teacher, lecture and transparencies to teach changing fractions to percents.

- 3-2-1 Lecture and transparencies
- 3-2-2 Wollensak tapes #C-3151
- 3-2-3 Work sheet - Changing fractions to percents
- 3-2-4 Cyclo-teacher

3-3-0 The project teacher will use Wollensak tape, Cyclo-teacher, lecture, and transparencies to teach changing percents to fractions.

- 3-3-1 Wollensak tape #C-3151
- 3-3-2 Work sheet - Changing percents to fractions
- 3-3-3 Cyclo-teacher

3-4-0 The project teacher will use Wollensak tapes, transparencies, Cyclo-teacher, and lecture to teach changing decimals to percents.

- 3-4-1 Lecture and transparencies
- 3-4-2 Wollensak tapes #C-3151
- 3-4-3 Work sheet - Changing decimals to percents
- 3-4-4 Cyclo-teacher

3-5-0 The project teacher will use Wollensak tapes, transparencies, Cyclo-teacher, and lecture to teach changing percents to decimals.

- 3-5-1 Lecture and transparencies
- 3-5-2 Wollensak tape #C-3154
- 3-5-3 Work sheet - Changing percents to decimals
- 3-5-4 Cyclo-teacher

3-6-0 The project teacher will use Wollensak tapes, Cyclo-teacher, transparencies, and lecture to teach finding a percent of a number, by changing the percent to a common fraction, then multiplying.

3-6-1 Lecture and transparencies
3-6-2 Wollensak tapes
3-6-3 Work sheet - Finding percent of a number by changing percent to fraction and multiplying
3-6-4 Cyclo-teacher

3-7-0 The project teacher will use Wollensak tapes, Cyclo-teacher, transparencies, and lecture to teach finding a percent of a number, by changing the percent to a decimal and multiplying.

3-7-1 Lecture and transparencies
3-7-2 Wollensak tapes
3-7-3 Cyclo-teacher
3-7-4 Work sheet on finding percent of a number by changing percent to a decimal and multiplying.

3-8-0 The project teacher will use lecture and a teacher prepared exercise to teach finding what percent one number is of another.

3-8-1 Lecture, using overhead projector
3-8-2 Work sheet - Finding percent one number is of another

3-9-0 The project teacher will use lecture and examples of practical problems, to teach problem solving.

3-9-1 Work sheet on percentage

3-10-0 The project teacher will administer teacher-made test on percentage problems.

3-10-1 Teacher-made test

ACTIVITIES

3-2-3 Work sheet on changing fractions to percents

1. Change the following fractions to percents.

a. 1/4 = _____%

b. 1/5 = _____%

c. 1/10 = _____%

d. 1/3 = _____%

e. 3/8 = _____%

f. 1/100 = _____%

g. 5/100 = _____%

h. 6/200 = _____%

i. 75/1000 = _____%

j. 225/1000 = _____%

k. 2/5 = _____%

l. 3/20 = _____%

m. 3/2 = _____%

n. 5/8 = _____%

o. 7/8 = _____%

p. 375/1000 = _____%

q. 1/400 = _____%

r. 875/100 = _____%

s. 3/25 = _____%

t. 5/50 = _____%

3-3-2 Work sheet on changing percents to fractions.

1. Change the following percents to fractions. Express answer in lowest terms.

   a. 25% = _____

   b. 15% = _____

   c. 30% = _____

   d. 50% = _____

   e. 80% = _____

   f. 40% = _____

   g. 8% = _____

   h. 6% = _____

   i. 3% = _____

   j. 33 1/3% = _____

   k. 20% = _____

   l. 150% = _____

   m. 500% = _____

   n. 1% = _____

   o. 3 1/2% = _____

   p. 9 1/4% = _____

   q. 22 3/4% = _____

   r. 15/100% = _____

   s. 1000% = _____

   t. 300% = _____

3-4-3 Changing decimals to percents

Since the % symbol represents two decimal places (hundredths), we can use the symbol to replace two decimal places. For example, .57 written as a percent is 57%.

Express each of the following decimals as a percent:

1.	.28	.61	.66
2.	.07	.02	.09
3.	.5	.7	.6
4.	5.00	7.00	8
5.	1.47	2.06	1.9
6.	.37	.06½	1.66 2/3
7.	.875	.0325	.0007
8.	.00½	.00 7/8	.00 3/4

3-5-3 Changing percents to decimals

The % symbol represents two decimal places (hundredths). When it is removed there should be two more decimal places than in the original number. For example, 45% can be written .45.

Express each of the following percents as a decimal

1.	25%	68%	17%
2.	6%	4%	2%
3.	40%	10%	60%
4.	195%	103%	278%
5.	170%	100%	240%
6.	62 1/2%	3 1/4%	33 1/3%
7.	24.7%	137.52%	.2%
8.	500%	900%	300%

3-6-3 Change % to fraction and multiply

EXAMPLE: a. 75% of 160
3/4 of 160 = 120

b. 125% x 200
1 1/4 x 200 = 250

1. 25% of 28 =
2. 33 1/3% of 60 =
3. 40% of 80 =
4. 37½% of 96 =
5. 150% of 44 =
6. 87½% of 56 =
7. 83 1/3% of 42 =
8. 20% of 645 =
9. 66 2/3% of 90 =
10. 200% of 33 =
11. 16 2/3% of 54 =
12. 237½% of 40 =
13. 90% of 37.20 =
14. 75% of 120 =
15. 62½% x 144 =
16. 30% of 130 =
17. 12½% x 432 =
18. 16 2/3% x 300 =
19. 12½% x 128 =
20. 37½% x 960 =

3-7-4 Solve the following problems by changing the percent to a decimal and then multiplying.

EXAMPLE: 6% of 30 = .06 x 30 = 1.8

1. 48% of 85 =
2. 11% of 98 =
3. 83% of 4,000 =
4. 9% of 200 =
5. 7% of 906 =
6. 4% of 296 =
7. 40% of 7 =
8. 15% x 98 =
9. 36% x 250 =
10. 88% x 500 =
11. 200% of 4.25 =
12. 61.4% of 2,400 =
13. 20.6% x 81 =
14. 2.5% x 3 =
15. 217% x 3500 =
16. 240% x 7500 =
17. 1.6% x 92.83 =
18. 1 1/2% x 1287 =
19. 4.9% of 2.91 =
20. 3/4% of 105.25 =

1. If a mechanic receives a 15% discount on parts, what is the amount of the discount if he buys a water pump priced @ $16.85?
2. A shipment of 144 head lights were received with 25% of them defective. How many were defective?
3. In 2 years a new car depreciates 40%. If it originally cost $5,200.00, how much did it depreciate?
4. A mechanic will receive a 20% increase in pay. If he previously received $150.00 a week, how much of an increase will he receive?
5. At the end of the year a dealer sold his new trucks at 15% discount. How much is this discount if the list price was $3,000?

3-8-2 Work sheet on finding what percent one number is of another.

To find what percent one number is of another you first write the numbers in fraction form, then do the indicated operation.

EXAMPLE: 5 is what percent of 10?

$$5/10 = \frac{5 \times 10}{10 \times 10} = 50/100 = 50\%$$

or 5/10 = five divided by 10 = 50%

$$10\overline{)\,5.00} = 50 = .50 = 50\%$$

$$\begin{array}{r} 5\,0 \\ \hline 0 \end{array}$$

1. Solve the following by using either method above:

   A. 2 is what percent of 4?

   B. 15 is what percent of 60?

   C. 3 is what percent of 60?

   D. 5 is what percent of 25?

   E. 9 is what percent of 27?

   F. What percent of 64 is 8?

   G. What percent of 120 is 6?

   H. What percent of 150 is 15?

   I. What percent of 160 is 20?

   J. What percent of 100 is 40?

   K. What percent of 50 is 75?

   L. 60 is what percent of 12?

3-8-2 1. If a mechanic received a case of headlights containing 24 lights and 6 of them are broken. What percent was broken?

2. In a shipment of 200 windshields 22 were broken. What percent was broken?

3. In a shipment of 25 tires, 5 were rejected. What percent was rejected?

4. If a mechanic charges $12.50 for replacing the spark plugs in an 8 cylinder car and the plugs cost $5.76, what percent of the total bill was the cost of the plugs?

5. If an axle cost $18.40 and retailed for $23.00, what percent of the retail price is the cost?

3-9-1 PRACTICAL APPLICATIONS

1. A mechanic earning $3.20 per hour receives a 10% increase in pay. What is his new hourly rate?

2. A repair shop reduces its working hours from 48 to 40 without reducing the weekly rate of pay of the mechanic. To what percent increase in pay is this equivalent?

3. Eight quarts of alcohol are used in the cooling system of a car which has a capacity of 8 gallons. What percent of the solution is alcohol?

4. If 1% of the supply of gasoline is lost per day through evaporation, how many gallons are lost each day from 5 tanks, each holding 2,000 gallons?

5. What is the grade of a hill which rises 80 feet in a horizontal distance of 400 feet?

6. A rear seat speaker switch costs $1.20. If the discount is 25%, what is the net cost of the switch?

7. By purchasing wire in 500 foot rolls, a discount of 49% is allowed. If the list price is 8¢ per foot, what is the net cost of the roll?

8. A particular make of automobile priced at $1975.95 depreciates 30% in one year. How much money does a purchaser lose in depreciation in one year?

9. A mechanic receives a commission of 6% on all parts he sells. He sold $48.00 worth of parts. What is his commission?

10. A car sells for $3,450.00 on which a commission of 12% is allowed. What is the amount of commission paid?

11. How much interest will $2,000 earn in one year if the interest rate is 5%?

12. A speedometer of a car shows 50 miles per hour, but actually the speed is 45 miles per hour. What is the percent of error.

13. In a class of 20 students the following marks are received on a test: 4 students, 86%, 8 students, 76%, 6 students, 64%; and 2 students, 96%. What is the class average?

14. What is the charge to a customer for flushing out and refilling the transmission of a car if the flushing liquid, of which 3 quarts are used, costs 28¢ per gallon; the refill takes 4 pints at a cost of 33¢ per pint; the labor charge is $1.50; and the garage receives a 100% profit on the material?

15. If a mechanic's hourly rate is $4.80 and this is increased 16 2/3%, what is the new hourly rate?

INSTRUCTIONAL MATERIALS

EVALUATIVE MATERIALS

UNIT TEST OF PERCENT

1. Complete the following:

   a. 40% = 40/ = ._____

   b. 15% = 15/ = ._____

   c. 5% = /100 = ._____

   d. ___% = 3/100 = ._____

   e. ___% = /100 = .25

2. Write the following as fractions with denominator of 100:

   a. 20% = _____

   b. 5% = _____

   c. 3% = _____

   d. 100% = _____

   e. 150% = _____

3. Write the following as percents:

   a. 15/100 = _____

   b. 5/100 = _____

   c. 33 1/3 /100 = _____

   d. 150/100 = _____

   e. 1/2 /100 = _____

4. In the blank to the left of the fractions in Column I place the percent found in Column II that is equivalent to the given fraction.

I	II
a. _____% 1/4	1. 12 1/2%
b. _____% 3/5	2. 50%
c. _____% 1/8	3. 125%
d. _____% 1/3	4. 15%
e. _____% 1/2	5. 60%
	6. 25%
	7. 33 1/3%

5. Change the following fractions to percents.

   a. 1/10 = _____

   b. 3/4 = _____

   c. 5/8 = _____

   d. 1/5 = _____

   e. 5/10 = _____

   f. 9/10 = _____

   g. 5/25 = _____

   h. 25/1000 = _____

   i. 375/1000 = _____

   j. 1/200 = _____

6. Change the following decimals to percents.

   a. .25 = _____%

   b. .15 = _____%

   c. .05 = _____%

   d. .006 = _____%

   e. 1.08 = _____%

   f. 2.5 = _____%

7. Change the following percents to decimals.

   a. 80% = _____

   b. 8% = _____

   c. 1% = _____

   d. 600% = _____

   e. 160% = _____

   f. 100% = _____

8. Solve the following problems by changing the percent to a fraction and multiplying.

   a. 15% of $5.00 = _____

   b. 3% of $1000 = _____

   c. 200% of $40 = _____

9. Solve the following problems by changing the percent to a decimal and multiplying.

   a. 12% of 40 = _____

   b. 5% of 250 = _____

   c. 125% of 500 = _____

10. Solve the following shop problems.

   a. If the total cost of repair on an automobile was $79.80 and the labor was $42, what percent of the total bill was the labor?

   b. If Mr. Jones repair bill was $212.50 and the state and local tax of 5% is to be added, what will the total bill be?

   c. If the weekly salary of a mechanic is $114 and he receives a $13.68 weekly increase in pay, what percent of increase did he receive?

   d. A gasoline storage tank contains 340 gallons of gas, which is 85% of the capacity of the tank. What is the capacity of the tank?

   e. If Mr. Jones' repair bill was $310 and he is allowed a discount of 20%, how much will he actually pay?

LIST OF MATERIALS

3-1-0 Wollensak tape H C-3151
Filmstrips

3-2-0 Wollensak tapes C-3151
Tape player
Filmstrips
Filmstrip projector

3-3-0 Wollensak tapes
Cyclo-teacher
Transparencies
Overhead projector
Tape players

3-4-0 Wollensak tapes
C Cyclo-teacher
Transparencies
Overhead projector
Tape player

3-5-0 Wollensak tape C-3154
Overhead projector
Transparencies
Tape player

3-6-0 Transparencies
Overhead projector
Wollensak tape
Cyclo-teacher
Work sheet

3-7-0 Transparencies
Overhead projector
Wollensak tape

3-8-0 Overhead projector
Work sheet
Transparenc'es

3-9-0 Work sheet

3-10-0 Evaluative materials

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 4

RATIO AND PROPORTION

Ratio and Proportion

4-0-0 At the end of this topic the students will be able to solve ratio and proportion problems related to power mechanics, as shown, by scoring 70% or above on a teacher made test.

4-1-0 The project teacher will teach comparison of numbers by division, using the chalk board and work sheet.

4-1-1 Lecture and discussion of ratio
4-1-2 Work sheet on ratio

4-2-0 The project teacher will use denominate numbers to reinforce understanding of ratio by use of overhead projector and work sheet.

4-2-1 Overhead projector
4-2-2 Work sheet on ratio

4-3-0 The project teacher will use lever, pulley, and work sheet to teach means-extremes product property of proportions.

4-3-1 Lecture with use of lever and pulleys
4-3-2 Work sheet

4-4-0 The project teacher will use practical problems related to power mechanics to apply knowledge of ratio and proportion.

4-4-1 Work sheet on mixture problems
4-4-2 Work sheet on pulley and gear problems (inverse proportions)

4-5-0 The project teacher will use teacher made test to evaluate the progress of the students.

4-5-1 Evaluative material

ACTIVITIES

4-1-2 Using quotients to compare numbers

Comparison of Numbers

A. Given two numbers 6 and 8 and you wish to compare 6 to 8, first write the two numbers as a fraction or ratio, then change the fraction or ratio to lowest terms. This will give you the ratio of 6 to 8.

Example: 6 to 8 written 6/8 or 6:8, then 6/8 = 3/4 therefore 6 is 3/4 times as large as 8.

B. Using the above example, let us compare 8 to 6 written 8/6 or 8:6 then 8/6 = 4/3 therefore 8 is 4/3 times as large as 6.

1. Write the following quotients as ratios in lowest terms.

2 ÷ 4 = _____
3 ÷ 15 = _____
5 ÷ 10 = _____
6 ÷ 10 = _____
3 ÷ 4 = _____

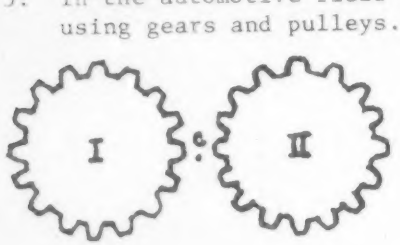
3 ÷ 12 = _____
20 ÷ 100 = _____
6 ÷ 30 = _____
2 ÷ 12 = _____
14 ÷ 70 = _____

2. For each pair of numbers below use the quotient in lowest terms to write a sentence comparing the first number with the second.

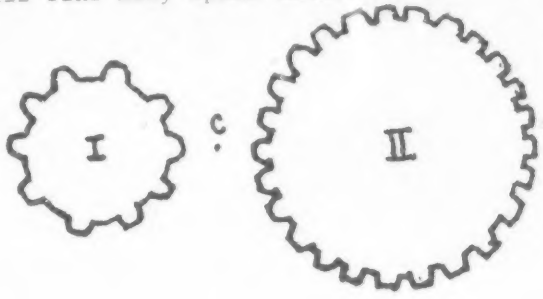
Example: 8, 16 = 8/16 = 1/2 therefore 8 is 1/2 times as large as 16.

(a) 3, 6 (b) 9, 12 (c) 18, 20 (d) 5, 25 (e) 10, 15
(f) 27, 72 (g) 28, 70 (h) 56, 24 (h) 63, 49 (j) 60, 48
(k) 125, 200 (l) 80,55 (m) 30, 72 (n) 54, 24 (o) 91, 39
(p) 8, 12 (q) 6,8

3. In the automotive field you will find many speed ratios when using gears and pulleys.



A



B

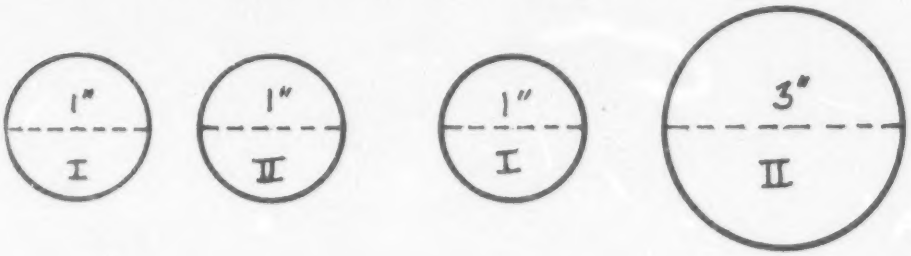
On diagram "A" above, how many teeth are there on each gear? ____
If the gears were engaged and revolved one complete turn, how many teeth would pass point C on gear I? _____ How many teeth

would pass point C on gear II? _____ Then is it true that these wheels have a 1 to 1 teeth ratio? _____ How many revolutions did each gear make? _____ Then what is the speed ratio? _____

Now look at diagram "B". How many teeth are there on gear I? _____ How many of gear II? _____ When gear I turns one complete turn, how many teeth will have passed point "c". If gear I was engaged in gear II, how many teeth on gear II will have passed point "c" when gear I makes one complete revolution? _____ How many revolutions will gear I have to make before gear II makes one complete turn? _____ What is the teeth ratio of gear I to gear II? _____. Gear II to gear I? _____

What is the speed ratio of gear I to gear II? _____

4.



A

B

Look at diagram "A". What is the diameter of each pulley? _____ When pulley I makes one complete turn, how many turns will pulley II make? _____ What is the speed ratio of pulley I to Pulley II? _____ If pulley I makes 5 revolutions, how many revolutions will pulley II make? _____ What is the ratio in lowest terms of pulley I to pulley II? _____

What is the ratio of the diameter of pulley I to pulley II? _____ Then is the ratio of the diameters of the two pulleys the same as their revolutions? _____

Now look at diagram "B". What is the diameter of pulley I? _____ How many turns will pulley I have to make for pulley II to make one complete turn? _____ What is the speed ratio of pulley I to pulley II? _____

If pulley I makes 30 revolutions, how many revolutions will pulley II make? _____

If we let "d" equal diameter of small pulley and "D" equal diameter of the large pulley, and "R" equal number of revolutions of the small pulley and "R" equal the number of revolutions of the

large pulley; then which of the following will be equivalent ratios?
d/D : T/R or R/d : T/D _____

5. Write the following ratios in lowest terms in the blanks to the right of the statement.

(a) What is the ratio of the small gear or pulley to the large gear or pulley?

Small gear or pulley	Large gear or pulley	Ratio
15 teeth	45 teeth	_____
24 revolutions	12 revolutions	_____
10 teeth	50 teeth	_____
500 revolutions	200 revolutions	_____
3 inch diameter	9 inch diameter	_____
4 inch diameter	12 inch diameter	_____

6. If a motor with a pulley 2 inches in diameter is hooked by belt to a fan with a pulley 6 inches in diameter, and I wish to cause the fan to turn faster, will I increase or decrease the size of the motor pulley? _____

4-2-2 Worksheet - Ratios using denominate numbers

When the quantities being compared are denominate numbers, they must first be expressed in the same units of measure.

Example: Express the ratio of 9 in. to 1 ft.
First, change 1 ft. to 12 inches,
then write the ratio 9:12 or 9/12 and
reduce to 3:4 or 3/4.

Express the ratio of each of the following:

1. 3 in. to 2 ft.
2. 1 yd. to 27 in.
3. 3 gal. to 2 qt.
4. 3 lbs to 12 oz.
5. 1 gal. to 2 pt.
6. 2 nickels and a quarter
7. a dollar to a dime
8. 2 dozen things to 10 things
9. 45 min. to 2 hrs.
10. 3 min. to 20 sec.
11. 6 mo. to 3 yrs.
12. 2 ft. 6 in. to 5 ft.
13. 30 min. to 1 hr. 30 min.
14. 2 oz. to 1½ lbs.
15. 4 in. to 1 1/3 ft.
16. 2 qt. to 1¼ gal.
17. 10 min. to 2 1/6 hr.
18. 50¢ to a dollar and a half
19. 1½ hrs. to 1 week
20. 2½ ft. to 3 yds.

4-3-2 Work sheet

A. Proportions are written in two ways:

3 : 2 = 18 : 12 or 3/2 = 18/12

The first and last terms (3 & 12) are called the extremes. The middle two terms are the means. The product of the extremes is equal to the product of the means.

3 x 12 = 36 2 x 18 = 36

See which of the following are true proportions.

Ex. 2/3 = 6/9 2 · 9 = 18 3 · 6 = 18 True

3 · 4 as 8 : 6 3 x 6 = 18 4 x 8 = ?? False

1. 3/5 = 15/25
2. 7/4 = 28/12
3. 7:5 as 35:25
4. 4: 9 as 24: 54
5. 3:7 as 12 : 24
6. 5/6 = 36/25
7. 7/9 = 63/81
8. 2/5 = 12/30
9. 7 : 9 = 28 : 45
10. 6:5 = 36 : 25

B. If any 3 terms of a proportion are known, the 4th can be found by using the means-extreme product property.

This block and tackle system gives an advantage of 4 : 1.

Ex. If the Resistance is 240 lbs., how much effort is required to lift it.

4 : 1 = 240 : E or 4/1 = 240/E
4E = 240 4E = 240
E = 240/4 E = 60
E = 60

Using examples above as a guide, find the missing terms in the following problems.

1. 4/5 = 12/E
2. 3/2 = F/10
3. G : X = 18 : 9
4. n/20 = 3/5
5. S/45 = 7/9
6. 96/C = 12/25
7. 2/7 = 26/N
8. 8/E = 120/75
9. 32/7 = 5/X
10. N/4 = 25/10

4-4-1 Ratio & Proportion -- Mixture Problems

1. A mixture of fuel is needed in a machine. If gasoline and oil are mixed in a ratio of 8:3 and 12 qts. of oil are used in the mixture, how many gallons of gas should be used?

2. If 2 pints of fluid are needed to service 3 cars, how many pints are needed to service 24 cars? How many cars can 1½ gallons of fluid service.

3. If 1 pt. of oil is mixed with 2 gallons of gasoline for a certain power saw, how many pts. would be needed to mix with 6½ gallons?

4. One gallon of solvent is mixed with 9 gallons of water to make a cleaning solution. How many gallons of solvent should be used with 20 gallons of water to make the solution?

5. Three quarts of acid are mixed with 2½ gallons of water to make a battery solution. How many quarts of acid should be mixed with 3/4 gallon of water to make the solution?

6. A certain lawn mower requires that 2 pints of oil be mixed with 1½ gallons of gasoline. How many pints of oil should be mixed with 5 gallons of gas?

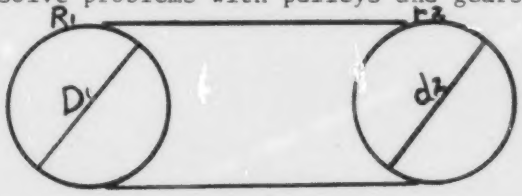
7. An outboard motor uses 1 pint of oil for 6 gallons of gas. How much oil is needed to mix with 2 gallons of gas.

8. An old motor uses 1 quart of oil for 6 gallons of gas. If you have 2½ quarts of oil how much gasoline do you need to mix with the oil?

9. If a certain color paint requires a 10 oz. tube of coloring to 1/2 gallon of white base paint, how many ounces of coloring will be required to color 15 gallons of paint.

4-4-2 Solving pulley and gear problems using inverse proportion

To solve problems with pulleys and gears we use an inverse proportion.



1. In the above figure if $D_1 = 8$; $d_2 = 6$; $r_2 = 180$ rpm, find R.

2. A 20 inch pulley turning 175 rpm drives a 5 inch pulley. How many revolutions per minute is the 5 inch pulley turning?

3. How many teeth are required on a gear if it is to turn at 270 rpm when driven by a gear with 42 teeth turning at 180 rpm?

4. What size pulley must be used on a motor turning at 1300 rpm in order to drive a 12 inch pulley at 325 rpm?

5. A 30 inch pulley is connected by belt to a 6 inch pulley. If the 30 inch pulley makes 250 rpm; how many revolutions per minute does the smaller pulley make?

INSTRUCTIONAL MATERIALS

Evaluative material - Ratio and Proportion

1. Ratio can be defined as the _____ of two numbers.

2. Write the following pairs of numbers as ratios in two different ways.

First number to second number

a. 3,4 _____ _____

b. 7, 9 _____ _____

c. 12, 15 _____ _____

d. 11, 18 _____ _____

e. 4, 5 _____ _____

f. 9, 4 _____ _____

g. 30, 10 _____ _____

h. 100, 25 _____ _____

i. 150, 15 _____ _____

j. 7, 35 _____ _____

3. For each pair of numbers below use the quotient in lowest terms to write a sentence comparing the first number with the second.

Example: 4, 12 4/12 = 1/3
4 is 1/3 times 12

a. 15, 30 _____ _____

b. 6, 16 _____ _____

c. 5, 20 _____ _____

d. 25, 32 _____ _____

e. 8, 64 _____ _____

f. 42, 7 _____ _____

g. 27, 9 _____ _____

h. 16, 4 _____ _____

i. 32, 8 _____ _____

j. 48, 16 _____ _____

4. Complete the following charts on ratios of small gear to large gear.

	Small gears	Large gears	Lowest terms Teeth ratio	Lowest terms Speed ratio
a.	5 teeth	25 teeth		
b.	15 teeth	60 teeth		
c.	6 teeth	30 teeth		
d.	35 teeth	165 teeth		
e.	20 teeth	200 teeth		
f.	25 teeth	75 teeth		
g.	9 teeth	27 teeth		
h.	7 teeth	49 teech		
i.	12 teeth	156 teeth		
j.	14 teeth	196 teeth		

5. Complete the following chart on pulleys; small to large.

	Diameter Small pulley	Diameter Large pulley	Diameter ratio	Speed ratio
a.	2"	4"		
b.	3"	12"		
c.	6"	24"		
d.	9"	12"		
e.	8"	24"		

6. Express the following denominate numbers as ratios in lowest terms.

   a. 3" to 9" _____

   b. 4 in to 2 ft. _____

   c. 3 pts. to 1 gal. _____

   d. 3 nickels to 1 quarter _____

   e. 2 dozen to 12 _____

   f. 20 sec. to 45 sec. _____

   g. 55¢ to 90¢ _____

   h. 3 mo. to 2 years _____

   i. 35 min. to 2½ hours _____

   j. 2½ ft. to 5 yds. _____

   k. 5 lbs. to 36 oz. _____

   l. 2 hrs. 20 min. to 5 hrs. _____

7. A number sentence stating two ratios equivalent is called _____. The first and last terms in the number sentence is called the _____ and the two middle terms are called the _____.

8. If two ratios are equivalent the product of the _____ must equal the product of the _____.

9. Which of the following ratios are equivalent.

   a. 3/4 : 9/12

   b. 5/8 : 10/16

   c. 1/3 : 5/6

   d. 8/9 : 56/63

   e. 3/10 : 5/15

   f. 15/32 : 32/64

   g. 3/8 : 9/16

   h. 2/5 : 15/25

10. Find the missing term in the following proportions.

a. $3/4 = N/16$	b. $5/8 = 15/N$	c. $2/3 = N/18$
d. $5/32 = 2/N$	e. $5/6 = N/12$	f. $9/16 = 27/N$
g. $2/10 = N/40$	h. $7/12 = N/36$	i. $15/16 = 75/N$

11. If a mixture of oil and gas are to be in the ratio of 3 pints of oil to 5 gallons of gas, how many pints of oil will you mix with 35 gallons of gas.

12. If 3 qts. of acid are needed in 4½ gallons of water to make a battery salution, how many quarts of acid will be needed in 18 gallons of water?

13. If a lawr mower requires 1 pint of oil to every 1½ gallons of gas, how many pints of oil will be required in a tank with 5 gallons of gas?

14. If a paint mixture requires 5 oz. of coloring to each gallon of base paint, how many oz. of coloring will be required for 5 gallons of paint?

15. If two gears, one with 12 teeth and one with 18 teeth are engaged, what is the speed ratio of the small gear to the large gear? What is the speed of the large gear if the small gear's speed is 100 revolutions per minute?

Material List for Ratio and Proportion

4-1-0 Chalk board, work sheet

- 4-1-1 Work sheet comparing numbers

4-2-0 Overhead projector, work sheet

- 4-2-1 Overhead projector
- 4-2-2 Work sheet understanding ratio

4-3-0 Lever, pulley, work sheet on means and extremes

- 4-3-1 Lever, pulley
- 4-3-2 Work sheet

4-4-0 Work sheet on practical problems on ratio and proportion

- 4-4-1 Work sheet on mixture problems
- 4-4-2 Work sheet on lever problems
- 4-4-3 Work sheet on pulley and gear problems

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

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C. Additional Information:

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2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 5
DIRECTED NUMBERS

Directed Numbers

5-0-0 Upon completion of this topic the students will demonstrate a basic knowledge of directed numbers by scoring 70% or above on a teacher made test.

5-1-0 The project teacher will use a number line, overhead projector, and lecture to teach addition of directed numbers.

5-1-1 Lecture and demonstration with the number line
5-1-2 Work sheet, adding directed numbers

5-2-0 The project teacher will use a number line, chalk board, and lecture to teach subtraction of directed numbers

5-2-1 Lecture and demonstration with the number line
5-2-2 Work sheet, subtracting directed numbers

5-3-0 The project teacher will use lecture and chalk board to teach multiplication of directed numbers.

5-3-1 Lecture and class discussion
5-3-2 Work sheet, multiplying directed numbers

5-4-0 The project teacher will use lecture and overhead projector to teach division of directed numbers.

5-4-1 Lecture and class discussion
5-4-2 Worksheet, dividing directed numbers

5-5-0 The project teacher will administer evaluative material.

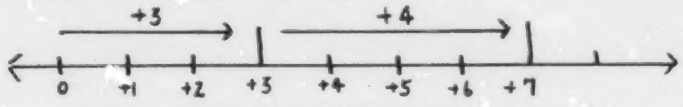
5-5-1 Teacher made test

ACTIVITIES

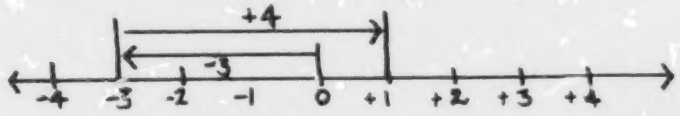
5-1-2 Addition of directed numbers

To add on the number line, we began at the point marked zero and use the sign placed to the upper left of the numeral to determine the direction to move. A move to the right is indicated by a positive (+) and a move to the left is indicated by a negative (-).

Example: To add +3 and +4 you begin at zero and move 3 units to the right, then 4 units to the right which will stop you on +7 as indicated in diagram below.



To add -3 and +4 you begin at zero and go 3 units left then 4 units right.



1. Follow the examples above and draw diagrams to indicate the addition of the following directed numbers.

a. +2 and +3	d. -2 and -3	g. +5 and -4
b. +3 and +4	e. +4 and -2	h. -6 and +10
c. -4 and +5	f. -6 and -2	i. +11 and 14

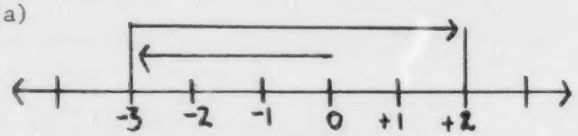
2. Add the following:

a. +6 +7	b. -10 +12	c. -36 - 4	d. +17 -17	e. -22 +24	f. - 6 -11

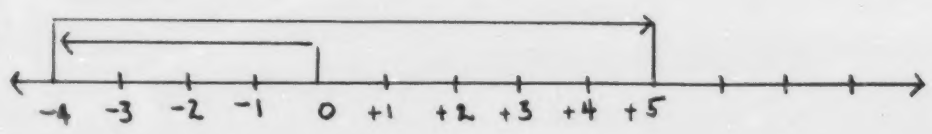
g. -4 +6 -11	h. (-7) + (+12)	i. 6 - 9 - 3	j. -2 + 5 + 2

3. Write a number sentence for each of the following diagrams.

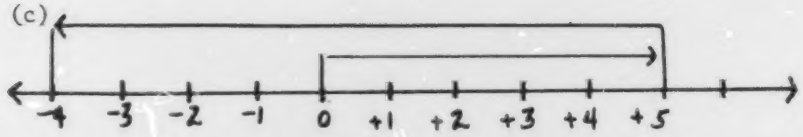
(a)



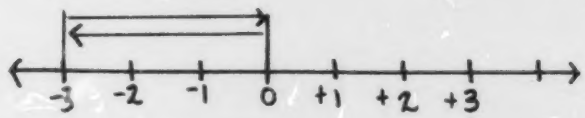
(b)



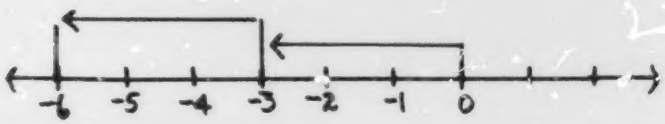
(c)



(d)



(e)



4. Add the following: Express answers to lowest terms:

a. $-\frac{3}{4} + (-\frac{1}{2})$ b. $+\frac{5}{6} + (-\frac{1}{6})$ c. $+\frac{2}{3} + (+\frac{1}{4})$ d. $+1\frac{15}{16} + (-\frac{3}{8})$

e. $+2\frac{5}{8} + (+1\frac{1}{4})$ f. $(-\frac{2}{3}) + (+\frac{1}{4}) + (-\frac{5}{6})$

g. $-1\frac{1}{4} + (-\frac{3}{8}) + 1\frac{1}{2}$ h. $-\frac{1}{2} + \frac{2}{3} + \frac{5}{6}$

i. $-\frac{3}{16} + \frac{5}{16} + \frac{3}{16}$ j. $\frac{1}{8} + (-\frac{3}{8}) + \frac{5}{8}$

k. $\frac{5}{32} + (-\frac{3}{64}) + \frac{5}{8}$ l. $-\frac{1}{4} + \frac{1}{2} + \frac{3}{4}$

m. $.4 + .2$ n. $.05 + .5$ o. $-.5 + -.2$ p. $-.15 + -.06$ q. $-.5 + +.3$

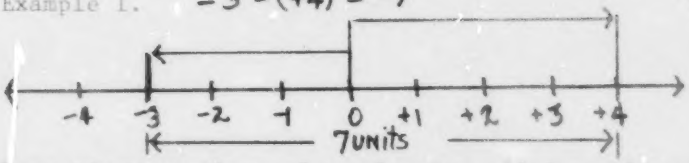
r. $(-.4) + (.3) + (-.03)$ s. $-1.5 + .14 + (-1.65)$

t. $-126.5 + (-.65)$ u. $.275 + (-.008)$

5-2-2 Subtraction of directed numbers

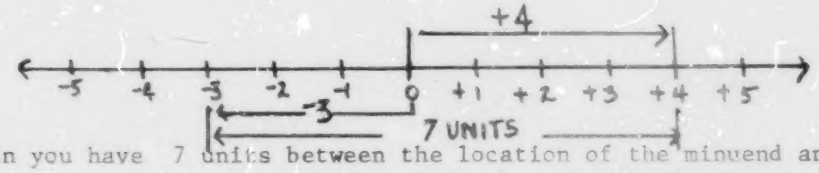
To subtract on the number line you begin at zero and locate both the minuend and subtrahend by counting from zero left for negative and right for positive, then count the number of units between the two locations as shown below.

Example I. $-3-(+4)=-7$



The above gives you the number of units added to the subtrahend to get the minuend. Since -7 must be added to a +4 to obtain a -3, the answer is -7.

Example II. $+4-(-3)=+7$



Again you have 7 units between the location of the minuend and subtrahend on the number line. Since -3 is the subtrahend you must add a positive 7 to a -3 to get the minuend +4. Therefore, the answer is 7.

1. By use of the examples above draw a number line and indicate the correct difference of the following subtraction problems.

   a. +2 - (+1)

   b. -4 + (+3)

   c. -5 - (-5)

   d. 7 - (-2)

   e. -4 - (-4)

2. Find the difference of the following:

Subtract:

a.	b.	c.	d.	e.
+7 +4	+12 - 4	-6 +3	+9 +2	-11 +2
f.	**g.**	**h.**	**i.**	**j.**
+25 -6	+12 + 5	+6 +14	-12 - 7	+26 - 5
k.	**l.**	**m.**	**n.**	**o.**
- 1 1/2 + 2/3	- 4 1/2 + 2 1/2	+ 5/6 - 2/3	15/16 - 3/4	-25/32 - 3/8

p. $-.1 + .3$

q. $+2.65 - 1.02$

r. $-5.2 - 3.5$

s. $-5.6 + 1.3$

t. $-15.9 - 4.6$

5-3-2 Work sheet – Multiplying directed numbers

When multiplying directed numbers with like signs, two plus signs or two minus signs, the product is always positive.

Example: (+2) x (+9) = +18 or (-4) x (-9) = +36

Multiply the following:

1. (+9) x (+9)
2. (+6) x (+7)
3. (+8) x (+6)
4. (+.92) x (+.3)
5. (+ 1/8) x (+ 1/3)
6. (-9) x (-5)
7. (-5) x (-11)
8. (-12) x (-10)
9. (-.001) x (-.09)
10. (- 1/2) x (-1/2)

When multiplying directed numbers with unlike signs, a plus and a minus or a minus and a plus, the product is always negative.

Example: (+2) x (-8) = -16 or (-5) x (+8) = -40

Multiply the following:

11. (+8) x (-7)
12. (+12) x (-8)
13. (+6) x (-9)
14. (+ 1/8) x (- 1/4)
15. (+.4) x (-.5)
16. (-9) x (+5)
17. (-15) x (+5)
18. (-6) x (+6)
19. (-.51) x (+.2)
20. (- 1/2) x (+ 1/4)

When multiplying directed numbers with several factors, the product is positive if there is an even number of minus signs and negative if there is an odd number of minus signs.

Example: (+2)(-3)(-2)(+3) = +36 or (-1)(-2)(+2)(-3) = -12

21. (+2)(-2)(-3) =
22. (1)(+4)(-3) =
23. (-1)(-1)(+2)(-1)(-2) =
24. (- 1/2) (1/4)(-1/3) =
25. (-.1)(+.1)(-.1) =
26. (-1)(-1)(-2) =
27. (+1)(-3)(-2)(-4) =
28. (-1)(+1)(+2)(-2)(+3)(-4) =
29. (- 1/2)(- 1/2)(- 1/2) =
30. (-.2)(-.2)(-.3) =

Additional multiplication exercises

31. $(+ 1/2)\ (-6) =$

32. $(- 1/2)(+4)(-7) =$

33. $(-7)(-11) =$

34. $(-.3)(+.5) =$

35. $(+8)(+.5) =$

36. $(-2)(-3)(-4)(+4) =$

37. $(+ 1/8)(- 1/2)(-16)(+14) =$

38. $(-23)(-3) =$

39. $(-75)(+3) =$

40. $(- 1/2)(- 1/2)(+ 1/3)(+ 1/3)(-36)(-1) =$

5-4-2 Work sheet - Dividing directed numbers

When dividing directed numbers with like signs, two plus signs or two minus signs, the quotient is always positive.

Example: $(+81) \div (+9) = +9$ or $(-72) \div (-36) = +2$

1. $(+36) \div (+4) =$
2. $(+55) \div (+5) =$
3. $(+225) \div (+15) =$
4. $(+ 3/8) \div (+ 3/4) =$
5. $(+.256) \div (+.16) =$
6. $(-45) \div (-5) =$
7. $(-75) \div (-15) =$
8. $(-42) \div (-3) =$
9. $(-1.21) \div (-1.1) =$
10. $(-16) \div (-1/2) =$

When dividing directed numbers with unlike signs, a plus and a minus, the quotient is always negative.

Example: $(+12) \div (-4) = -3$ or $(-16) \div (+8) = -2$

11. $(+21) \div (-7) =$
12. $(+66) \div (-3) =$
13. $(+125) \div (-25) =$
14. $(+70) \div (-.35) =$
15. $(+ 1/3) \div (- 2/5) =$
16. $(-63) \div (+7) =$
17. $(-150) \div (+5) =$
18. $(-78) \div (+39) =$
19. $(- 1.44) \div (+1.2) =$
20. $(- 3/5) \div (+11/15) =$

Problems involving both multiplication and division.

21. $(+6)(-4) \div (-12) =$
22. $(-8)(-7) \div (-2) =$
23. $(+9) \div (-3)(-4) =$
24. $(-300) \div (-30) \div (+2)(-8) =$
25. $(-1/6)(-3/4) \div (+1/4) =$
26. $(+.1)(-.1)(-.1) \div (-.001) =$
27. $(-1/2)(+1/2) \div (-1/2) =$
28. $(-1/8)(-1/4) \div (-1/32) =$
29. $(-.225) \div (-.5)(-.5) =$
30. $(-3/4) \div (-3/4)\ (-.45) =$

INSTRUCTIONAL MATERIALS

5-5-1 Unit Test

1. Add the following directed numbers:

a. +5 / +3

b. -9 / -4

c. +10 / - 6

d. -15 / +25

e. +4 / -4

f. +2/3 / -1/3

g. -1 1/2 / -4 3

h. -.567 / +.152

i. -.05 / -.145

j. -.2 / +.05 / -.625

2. Subtract the following:

a. +4 / +2

b. -6 / -2

c. +7 / -3

d. +3 / +8

e. -7 / -7

f. +3/4 / +1/4

g. -5/8 / -3/8

h. -13/16 / + 1/4

i. -2.68 / +1.05

j. +5.67 / +3.06

3. Multiply the following:

a. +3 / -3

b. +4 / +2

c. -5 / +3

d. +3 x (-6) =

e. -2/3 x +4/5 =

f. -1/2 x -1/3 =

g. +2 1/2 x -4/5 =

h. -3 1/4 x -1 1/2 =

i. -.05 x +.6 =

j. (-.009) x (-.4) =

k. (-1.5) x (+3.2) =

4. Division:

a. -32 ÷ +8 =

b. +25 ÷ +5 =

c. -9 ÷ -3 =

d. -64/-16 =

e. $-12\overline{)+72}$ =

f. -3/4 ÷ +2/3 =

g. +1/2 ÷ +1/4 =

h. -15/16 ÷ -3/4 =

i. -2 1/2 ÷ - 3/4 =

j. (-36) ÷ (-2.4) =

k. (-11.9) ÷ (-1.7) =

l. +64 ÷ (-8) =

5. Perform the indicated operations

a. $(+3) + (+4)$

b. $(-15)(+5) =$

c. $(-4) + (-3)$

d. $(-25) \div (-5) =$

e. $(-25) - (+4) =$

f. $+3 - (-2) + (+4) =$

g. $-15 + (+5) - (+6) =$

h. $(-6)\ (-5) \div (-3)$

i. $(-3/4)\ (-2/3) =$

j. $(-1.5)\ (+.06) =$

K. $\left[(17)(11) - (14.2)(15) \div (.6)\ (.04)\right] \times (-4.3) =$

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 6

FORMULAS

FORMULAS

6-0-0 Upon completion of this topic the students will demonstrate a basic understanding of formulas and their relation to power mechanics by scoring 70% of above on a teacher made test.

6-1-0 The project teacher will use lecture and the chalk board to teach writing mathematical statements as formulas.

6-1-1 Lecture, working examples on the board and class discussion.
6-1-2 Work sheet - formula writing

6-2-0 The project teacher will use lecture and the overhead projector to teach evaluation of formulas.

6-2-1 Lecture and class discussion
6-2-2 Work sheet, evaluating formulas

6-3-0 The project teacher will use lecture and chalk board to teach solving equations by the subtraction method.

6-3-1 Lecture and class discussion
6-3-2 Work sheet, solving equations by subtraction

6-4-0 The project teacher will use lecture and overhead projector to teach solving equations by addition method.

6-4-1 Lecture and class discussion
6-4-2 Work sheet, solving equations by additon

6-5-0 The project teacher will use lecture and overhead projector to teach solving equations by division.

6-5-1 Lecture and class discussion
6-5-2 Work sheet, solving equations by division

6-6-0 The project teacher will use lecture and overhead projector to teach solving equations by multiplication.

6-6-1 Lecture and class discussion
6-6-2 Work sheet, solving equations by multiplication.

6-7-0 The project teacher will use lecture and overhead projector to teach solving equations by a combination of the previous methods used.

6-7-1 Lecture and class discussion
6-7-2 Work sheet, solving equations

6-8-0 The project teacher will use lecture and chalk board to teach problem solving related to power mechanics by the use of formulas.

6-8-1 Lecture and class discussion
6-8-2 Work sheet, problem solving

6-9-0 The project teacher will administer evaluative material.
Test

ACTIVITIES

6-1-2 Work sheet - Formula writing

Express each of the following as a formula:

1. The area of a rectangle (a) is equal to the product of the length (l) and width (w).

2. The distance (D) that an automobile travels is equal to the product of the rate (r) and time (t).

3. The sum of the angles A, B, and C of triangle ABC is 180^{o}.

4. The perimeter of a rectangle (p) is twice the sum of the length (l) and width (w).

5. The displacement of the piston (D) equals the area of the piston (A) times the stroke (S).

6. The cutting speed (s) of a handsaw in feet per minute is equal to pi times the diameter (d) in feet times the number of revolutions per minute (R).

7. The capital (C) of a business is the difference between the assets (A) and the liabilities (L).

8. The selling price (s) is equal to the sum of the cost (c) and the profit (p).

9. The rate of discount (r) is equal to the discount (d) divided by the list price (l).

10. The horsepower (H.P.) required for the wing of an airplane equals the product of the drag of the wing (D) and the velocity (V) divided by 550.

6-2-2 Work sheet - Evaluating formulas

Find the value of the following:

1. D, when R = 55 mph., t = 3 hours, using the formula D = rt.
2. p, when S = 8, using the formula P = 3 s.
3. E, when I = 9 and R = 15, using the formula E = IR.
4. A, when p = 125 and i = 19, using formula A = p+i.
5. F, when C = 40, using the formula F = 1.8 C + 32.
6. B when A = 53, using the formula B = 90-A.
7. b, when p = 23 and e = 8, using the formula b = p - 22.
8. a, when n = 8, using the formula A = 360/n.
9. r, when d = 171 and t = 9, using the formula r = d/t.
10. W, when w = 75, l = 12, and L = 6, using the formula W = wl/L.

6-3-2 Work sheet - Solving equations by subtraction

Solve the following equations:

1. X + 3 = 13
2. X + 29 = 54
3. 11 + N = 27
4. 51 + X = 69
5. 65 = y + 19
6. 39 = X + 39
7. 9 = 6 + N
8. 32 = 17 + c
9. 94 = 56 + T
10. X + 3/4 = 9
11. 2 2/7 + X = 4 1/4
12. N + .9 = 6.3
13. $15 = N + $2.75
14. 12 = N + 5 3/8
15. c + 5 = 7.3
16. N + 3/5 = 2 1/10
17. x + 1.9 = 7.4
18. N + 1 3/4 = 3 4/16
19. N + 1/5 = 2 1/4
20. N + 9.9 = 11

6-4-2 Work sheet - Solving equations by addition

Solve the following equations:

1. N - 3 = 8
2. X - 12 = 9
3. X - 7 = 18
4. 15 = N - 5
5. 64 = x - 33
6. N - 9 = 9
7. 41 = N - 41
8. 0 = x - 20
9. N - 1/2 = 3/4
10. X - 7 1/2 = 5
11. 9 = N - 2 3/8
12. 5 3/4 = N - 5 1/4
13. N - .9 = 3.4
14. 9.3 = X - 7
15. X - $.08 = $.83
16. N - $1.55 = $.75
17. X - .3 = 4.7
18. 6 1/2 = N - 7/8
19. N - $.28 = $.12
20. 32 = X - 20

6-5-2 Work sheet - Solving equations by division

Solve the following equations:

1. $8X = 72$
2. $9N = 45$
3. $54 - 9N$
4. $15N = 60$
5. $14 = 14X$
6. $5X = 0$
7. $0 = 8N$
8. $10N = 80$
9. $12X = 84$
10. $12 = 3N$
11. $7N = 1$
12. $5 = 7X$
13. $8X = 6$
14. $.2X = 18$
15. $\$.06X = \$1.32$
16. $1/2\ N = 27$
17. $.40 = 4/5\ N$
18. $2\ 1/2\ X = 15$
19. $2/3X = 18$
20. $16N = 400$
21. $16X = 30$
22. $25N = 15$
23. $1.05\ N = 420$
24. $1\ 1/4\ X = 8\ 3/4$
25. $.04X = 96$

6-6-2 Work sheet - solving equations by multiplication

Solve the following equations:

1. $x/3 = 7$
2. $N/6 = 4$
3. $N/7 = 0$
4. $9 = x/4$
5. $N/4 = 15$
6. $x/12 = 5$
7. $16 = N/20$
8. $x/10 = 12$
9. $N/8 = 1.8$
10. $X/1.04 = 60$
11. $1/2\ N = 27$
12. $1/3\ X = \$.54$
13. $X/7 = 1$
14. $N/2 = 48$
15. $\$1.25 = 1/8\ N$
16. $1/4\ X = 9$
17. $30 = x/6$
18. $N/.5 = .5$
19. $\frac{N}{1/2} = 3/8$
20. $\frac{X}{1/2} = 1/4$
21. $\frac{X}{1\ 1/2} = 1\ 1/4$
22. $N/1.005 = 32.04$
23. $1\ 1/2 = X/2$
24. $1\ 3/8 = X/4$

6-7-2 Work sheet - Solving equations

Solve the following equations:

1. $3X + 7 = 31$
2. $8N + 9 = 57$
3. $5N + 6 = 71$
4. $9X + 8 = 80$
5. $6N + 13 = 35$
6. $7X + 19 = 68$
7. $12N + 35 = 59$
8. $70 = 11N + 26$
9. $8N - 45 = 45$
10. $4N - 13 = 11$
11. $18N - 45 = 45$
12. $4N - 23 = 19$
13. $7N - 3N = 28$
14. $5N = 52 - 27$
15. $1.8X + 32 = 68$
16. $30 + .6X = 45$
17. $2/5\ N = 8$
18. $5/8\ N - 8 = 22$
19. $15 = 12X - 57$
20. $3/5\ N = \$.87$
21. $N + 1/2\ N = 4\ 1/2$
22. $3/4\ N = 8.46$
23. $N - .25N = \$.81$
24. $X + .12X = 560$
25. $9N - 4N + 2N = 63$

6-8-2 Work sheet - Problem solving

Solve the following:

To find the voltage, amperage, or resistance in electrical circuits the formula I + E/R is used. E = voltage, I = amperes, and R = resistance (ohms).

1. The lighting system of an automobile draws 5 1/2 amperes at a battery voltage of 11. Find the resistance of the lighting system.

2. With a 12-volt battery, what is the resistance of the starting motor if 60 amperes are flowing during starting?

3. If the blower motor in a car heater has a resistance of 6 ohms, what current will flow from the 12-volt battery?

4. An automobile horn requires only .3 amperes from a 12-volt battery. What is its resistance?

To find the circumference of a circle use either of the following formulas:

$C = \pi D$ or $C = 2\pi R$ where C = circumference, D = diameter, R = radius π = 3.1416 or 3.14.

5. If the diameter of a circle is 8 inches, what is the circumference? What is the radius?

6. If the circumference of a circle is 60 inches, what does the ddiameter equal in inches? What does the radius equal?

7. If the radius of a circle is 12 inches, what is the circumference? What is the diameter?

8. Find the area of a circle when the diameter is .050 inch. ($A = \pi r^2$)

9. Find the area of a circle when the diameter is 1/4 inch.

10. Find the area of a circle when the radius is 3 5/8 inches.

11. With a turning radius of 15 feet (measured from the center of the car to the pivot point), how many feet farther would one rear wheel travel than the other in making a 90° turn? The standard track or tread equals 56 inches.

12. How wide should a road be to permit a U-turn if the smallest turning radius is 13 feet?

13. In order to make a U-turn with a radius of 15 feet, how many feet will one wheel travel further than the opposite wheel?

14. What diameter valve is necessary to close an intake port whose area equals 8 3/4 square inches?

15. Find the diameter of an oil drum if the area of the ball is $12.75 square feet.

INSTRUCTIONAL MATERIALS

Evaluative Material

I. Express each of the following as a formula:

A. The area of a triangle (A) is equal to 1/2 the product of the base (b) and the height (h).

B. The rate (r) that an automobile travels is equal to the distance (d) divided by the time (t).

C. The area (A) of a circle is equal to pi times the radius (r) squared.

D. The circumferece (c) of a circle is equal to pi times the diameter (d).

E. The perimeter (p) of a square is equal to four times the length of one side (s).

II. Evaluate the following formulas:

A. Find the value of t when d = 400 miles and r = 50 m.p.h., using the formula t = d/r.

B. Find the value of P when S = 3.5, using the formula P = 4S.

C. Find the value of E when I = 4.2 and R = 17.3, using the formula E = IR.

D. Find the value of F when C = 20, using the formula F = 1.8C + 32.

E. Find the value of a, when n = 9, using the formula a = 360/n.

III. Solve the following equations:

1. X + 4 = 12
2. 43 = N + 43
3. X - 4 = 8
4. 16 = N - 6
5. 9X = 81
6. 12 = 4N
7. X/4 = 8
8. N/3 = 15
9. X + 9 = 15
10. X/5 = 16
11. X - 12 = 8
12. 5N = 75
13. N + .9 = 1.4
14. 1/2 X = 21
15. X - 3/4 = 1/8
16. 8N - 5 = 27
17. 4X - 23 = 19
18. N + .12N = 560

IV. Write an equation for each of the following, then solve.

1. What is the resistance of the starting motor if 48 amperes are flowing during starting, with a 12-volt battery?

2. If the blower in an air conditioner has a resistance of 6 ohms, what current will flow from the 12-volt battery?

3. An automobile brake light requires only .6 amperes from a 12-volt battery. What is the resistance?

4. If the diameter of a circle is 10 inches, what is the circumference? What is the radius?

5. If the circumference of a circle is 40 inches, what does the diameter equal in inches?

Material list for Formulas

6-1-2 Work sheet on formula writing and overhead projector

6-2-2 Work sheet on evaluating formulas and overhead projector

6-3-2 Work sheet on equation solving and overhead projector

6-4-2 Work sheet on equation solving and overhead projector

6-5-2 Work sheet on equation solving and overhead projector

6-6-2 Work sheet on equation solving and overhead projector

6-7-2 Work sheet on equation solving and overhead projector

6-8-2. Work sheet on equation solving and overhead projector

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

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Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 7

METRIC SYSTEM

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Metric System

7-0-0 Upon completion of this topic the students will show a basic knowledge in metric measurements used in power mechanics by scoring 70% or above on a teacher made test.

7-1-0 The project teacher will use a metric scale to familiarize the students with linear measurements.

7-1-1 Use metric rule to show units of measure in the metric system
7-1-2 Measure several nuts and bolts using metric rule
7-1-3 Work sheet - Metric linear measurement

7-2-0 The project teacher will use a metric scale and teacher made charts to show comparison of metric units of measure.

7-2-1 Use metric scale to add several small units to obtain a larger unit
7-2-2 Work sheet - Comparison of metric units

7-3-0 The project teacher will use the meter stick and the yard stick to compare the English and the metric systems.

7-3-1 Construct chart comparing English and metric linear systems
7-3-2 Work sheet - coverting English and metric linear systems

7-4-0 The project teacher will use lecture and transparencies to teach basic concepts of liquid measurement in the metric system as related to power mechanics.

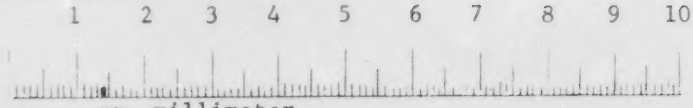
7-4-1 Lab exercise comparing quarts to liters, etc.
7-4-2 Work sheet - metric liquid measurements

7-5-0 The project teacher will administer evaluative material.

7-5-1 Unit test

ACTIVITIES

7-1-3 Metric Linear Measurements



1. The basic unit of measure in the metric system is the _____.

2. The meter rule is broken into _____ units, and each of these units is called a _____.

3. Look at the scale above.

   How many millimeters in one centimeter? _____

   How many centimeters in one decimeter? _____

   How many millimeters on one decimeter? _____

   How many decimeters in one meter? _____

4. To the right of the following prefixes write the numeral signified by the prefix:

   a. milli (m) _____ e. hecto (h) _____

   b. centi (c) _____ f. kilo (k) _____

   c. deci (d) _____ g. mega _____

   d. deca (dc) _____

5. Use a metric rule to measure and record the length of the following line segments:

   a. — b. —— c. ——— d. ————

   e. ———————— f. ———————— g. ————————

   h. ————————————————————————

   i. ————————————————————————

7-2-2 Comparison of metric units

1. Study the following example and complete the chart below.

Example:	Km.	hm.	dcm.	M.	dm.	cm.	mm.
	5	50	500	5,000	50,000	500,000	5,000,000

KM.	hm.	dcm.	M.	dm.	cm.	mm.
1						
			15			
						500
				1000		
		250				
	35					
25						
					2000	
						15,000,000
			2,560			
					3,656	

2. Complete the following:

a. 1 dm. = _____ mm.

b. 1 cm. = _____ mm.

c. 1 dm. = _____ cm.

d. 1 mm. = _____ cm.

e. 1 dm. = _____ m.

f. 1 cm. = _____ m.

g. 1 mm. = _____ m.

h. 1 mm. = _____ dm.

7-3-2 Comparing Metric and English Measurement

1. The lengths of the line segments below are recorded in the English measurement. Use your metric scale to measure the segment and record your answer to the nearest millimeter.

a. _____ b. _____ c. _____ d. _____

e. _____ f. _____ g. _____ h. _____

i. _____ j. _____

2. Use your English rule to measure and record the following metric measurements as English measurements to the nearest 16th inch.

a. _____ b. _____ c. _____ d. _____ e. _____

f. _____ g. _____ h. _____ i. _____

j. _____ k. _____

l. _____

3. If one meter equals 39.37 inches and one inch equals approximately 25 mm. or 2½ cm., convert the following English measurements to metric readings. Record answer to nearest millimeter.

a. 1" = _____ f. 1 ft. = _____

b. 2" = _____ g. 2 ft. = _____

c. 3" = _____ h. 3 ft. = _____

d. 4" = _____ i. 10 ft. = _____

e. 5" = _____ j. 100 ft. = _____

Metric Problems Related to Power Mechanics

4. Using the formula given, find the engine displacement of the following engines.

   Formula: E. D. = $\pi r^2 hn$
   r = radius of piston
   h = stroke of piston
   n = number of cylinders

   A. cylinders 8
      stroke 74mm.
      piston diameter 82.5mm.

   B. cylinders 6
      bore 95mm.
      stroke 80mm.

   (Express your answer in cubic inches by multiplying cubic centimeters by .061.)

5. Find the total displacement of a Volkswagon engine with 4 cyclinders, a 64mm bore and a stroke of 59mm. Express answer in cubic millimeters and then change to cubic inches by dividing by 645.

6. Find the displacement of a 8 cyclinder engine with a bore of 4.5 inches and a stroke of 3.5 inches. Convert your answer to cubic centimeters.

7-4-2 Metric Liquid Measurements

1. The liter is the basic unit of liquid measure in the metric system and the same prefixes are used as in linear measurements.

Example:

kl.	hl.	dcl.	l.	dl.	cl.	ml.
5	50	500	5000	50,000	500,000	5,000,000

Use the example above to complete the following chart.

kl.	hl.	dcl.	l.	dl.	cl.	ml.
			1			
5						
					500	
	3					
						2000
				25		
3.5						

2. Change the following to liters.

a. 125 ml. = _____ L.

b. 1000 ml. = _____ L.

c. 1.74 kl. = _____ L.

d. 2 kl. = _____ L.

e. .067 kl. = _____ L.

f. 35 ml. = _____ L.

g. 2 ml. = _____ L.

h. 100 kl. = _____ L.

3. Liquid measurements in the metric system may be thought of as units of capacity.

A cube with edges 1 desimeter in length is called a cubic decimeter (cu. dm.).

One cubic decimeter is equal to 1000 cubic centimeters (cc). One cubic decimeter or 1000 cubic centimeters is equal to one liter.

The chart for capacity in the metric system is similar to the liquid measurements.

Example: 1000 cu. mm = 1 cu. cm
1000 cu. cm = 1 cu. dm
1 cu. dm. = 1 liter
1 cu. cm. = 1 milliliter

Complete the following chart.

CAPACITY

Cu. M.	Cu.dm.	Cu. cm.	Cu. mm.
1			
	250		
		500	
			5,200
		625	
	3,750		
5.5			

4. Express each of the following as liters.

(a) 1 cu. dm. = _____ L.

(b) 1000 cu. cm. = _____ L.

(c) 50,000 cu. mm. = _____ L.

(d) 10 cu. dm. = _____ L.

(e) 15,000 cu. cm. = _____ L.

(f) 500,000 cu. mm. = _____ L.

5. If 1 quart equals .95 liters change the following quarts to liters.

(a) 2 qts. = _____ L.

(b) 5 qts. = _____ L.

(c) 10 qts. = _____ L.

(d) 4 qts. = _____ L.

(e) 25 qts. = _____ L.

(f) 32 qts. = _____ L.

(g) 50 qts. = _____ L.

(h) 1000 qts. = _____ L.

(i) 500 qts. = _____ L.

(j) 75 qts. = _____ L.

6. Change the following liters to quarts.

(a) 3 l. = _____ qts.

(b) 8 l. = _____ qts.

(c) 10 l. = _____ qts.

(d) 50 l. = _____ qts.

(e) 4.5 l. = _____ qts.

(f) .5 l. = _____ qts.

7-5-1 Unit Test

I. Complete the following charts on metric measurements.

(a)

km.	dcm.	hm.	M.	dm.	cm.	mm.
			250			
		62.5				
						25,000,000
				4226		
18.4						
					74,560	
	81.5					

(b)

kl.	dcl.	hl.	l.	dl.	cl.	ml.
22.6						
			2510			
						185,600
	215					
		555				
					75,000	
				627.2		

(c)

Cu. M.	Cu. Dm.	Cu. Cm.	Cu. Mm.
.5			
	25		
			92,150
		45,627.5	
.03			

II. Solve the following problems:

(a) 1 M. = _____ cm.

(b) 15 dm. = _____ cm.

(c) 5 km. = _____ M.

(d) 10 dcm. = _____ cm.

(e) 500 mm. = _____ cm.

(f) 1 mi. = _____ mm.

(g) 1 ft. = _____ cm.

(h) 1 yd. = _____ M.

(i) 12 ft. = _____ M.

(j) 6 in. = _____ cm.

(a) 1 L. = _____ cl.

(b) 6 L. = _____ ml.

(c) 5 dl. = _____ ml.

(d) 1 dcl. = _____ L.

(e) 15 cl. = _____ dl.

(f) 1 qt. = _____ L

(g) 5 pts. = _____ L.

(h) 150 ml. = _____ pts.

(i) 1000 cl. = _____ ml.

(j) 5000 ml. = _____ L.

III. (a) If the diameter of one size international thread is 22 millimeters, what is the diameter in inches to the nearest thousandth of an inch? _____

(b) What is the inside measurement in inches to the nearest thousandth of an inch of a cylinder that is 152 millimeters in diameter? _____

(c) A pulley is 4.5 inches in diameter. What is the diameter in millimeters? _____

(d) In problem (c), compute the circumference and area of the pulley in centimeters. _____

(e) What is the diameter in inches of a spark plug with an 18 millimeter diameter? _____

INSTRUCTIONAL MATERIALS

MATERIAL LIST ON METRIC MEASUREMENTS

6-1-0 Metric rule, bolts, nuts

6-2-0 Meter stick, yard stick

6-3-0 Transparencies, over-head projector

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Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 8

GEOMETRY

GEOMETRY

8-0-0 Upon completion of this topic the students will show a basic knowledge of geometry as used in power mechanics, by scoring 70% or above on a teacher-made test.

8-1-0 The project teacher will use lecture and overhead projector to develop an understanding of the various kinds of angles and their measurements.

8-1-1 Lecture on acute, obtuse, right, straight and reflex angles.
8-1-2 Work sheet on identifying and measuring angles.

8-2-0 The project teacher will use lecture and cyclo-teacher to familiarize the students with various geometric shapes.

8-2-1 Lecture on triangles, quadrilaterals and circles
8-2-2 Cyclo-teacher M-60
8-2-3 Work sheet on geometric figures

8-3-0 The project teacher will use a steel rule and a metric rule to find the perimeter of various geometric figures.

8-3-1 Work sheet on measuring perimeters.

8-4-0 The project teacher will use lecture, cyclo-teacher, and chalk board to teach finding the perimeter of various geometric shapes using formulas.

8-4-1 Lecture
8-4-2 Cyclo-teacher M 61, M 65
8-4-3 Work sheet on finding perimeter

8-5-0 The project teacher will use lecture, cyclo-teacher, and transparencies to teach finding areas of geometric shapes.

8-5-1 Lecture
8-5-2 Cyclo-teacher
8-5-3 Work sheet on finding areas

8-6-0 The project teacher will use lecture, filmstrips and transparencies to teach finding the volume of geometric solids.

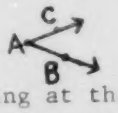
8-6-1 Lecture
8-6-2 Filmstrip (Box 6)
8-6-3 Work sheet on volumes

8-7-0 The project teacher will administer evaluative material on geometry as related to power mechanics.

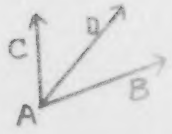
8-7-1 Unit test

ACTIVITIES

8-1-2 Identifying and measuring angles. An angle can be defined as two rays having a common end point.

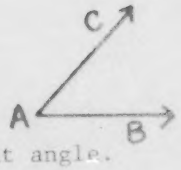
Example: 

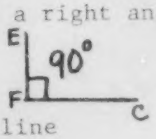
read angle ($\angle$) CAB or BAC



1. Looking at the diagram at the right, how many angles can you name? _____

2. With your protractor measure $\angle$CAB at right. _____ Is the measurement less than or greater than 90°. _____ If the measurement is less than 90° it is an acute angle, and if it is greater than 90° and less than 180° it is called an obtuse angle. Is $\angle$ CAB acute or obtuse? _____ If an angle has a measurement of exactly 90° it is called a right angle.



Example: 

When the sides of an angle lie in a straight line the angle is called a straight angle. The measurement of a straight angle is 180°. Angle C A B is a straight angle.

A reflex angle is an angle whose measure is greater than 180° but less than 360°. Look at figure I. The reflex angle CAB is equal to 280°. Acute angle CAB = 80°.

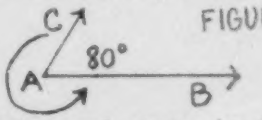
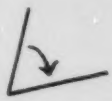
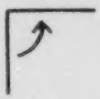
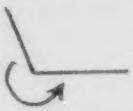


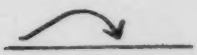
FIGURE I

3. With a protractor measure the following angles and state in the blank below each angle if it is acute, obtuse, right, straight or reflex.

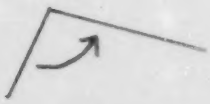

(a) _____

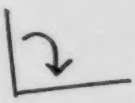

(b) _____


(c) _____


(d) _____

(e) _____


(f) _____


(g) _____

(h) _____

4. In figure II state the measurements of the following angles:

(a) CAB = _____
(b) RAC = _____
(c) YAX = _____
(d) CAR = _____
(e) YAB = _____
(f) RAB = _____
(g) YAR = _____
(h) BAX = _____
(i) SAR = _____
(j) XAC = _____

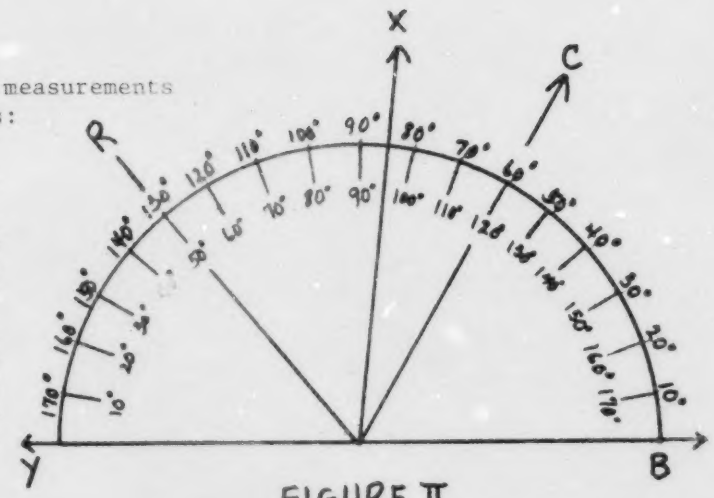


FIGURE II

8-2-3 Geometric Figures

Polygons are geometric figures consisting of the union of line segments having common end points not in a straight line.

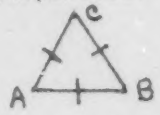
The simplest polygon is the triangle named so because of the number of sides it has.

The chart below shows how polygons are named according to the number of sides.

no. of sides	Name
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
8	octagon
10	decagon
12	dodecagon

The three sided polygon or triangle is further classified according to certain characteristics or properties.

1. Measure the sides of ABC. Are they equal? _____

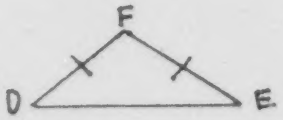


If all the sides of a triangle are equal it is called an equilateral triangle.

2. Look at triangle DEB. What is the measurement of its sides?

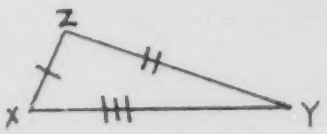
_____

DF = _____
EF = _____
DE = _____



Does DF = EF? _____ If a triangle has two sides equal it is called an isosceles triangle.

3. Measure the sides of triangle XYZ.
XY = _____, YZ = _____, XZ = _____



Do any of the sides equal each other? _____

If a triangle has none of its sides equal in length it is called a scalene triangle.

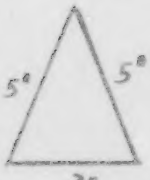
Triangles also are named according to the angles they contain.

If a triangle has a 90° angle it is called a right triangle. If all the angles in a triangle are acute it is called an acute triangle. If all the angles are equal it is called an equiangular triangle. If a triangle contains an obtuse angle it is called an obtuse triangle.

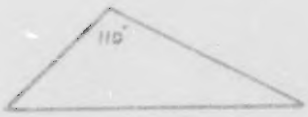
4. Classify the following triangles according to information given.

(a) _____

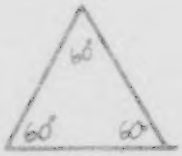
(b) _____



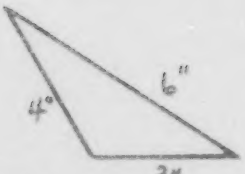
(c) _____



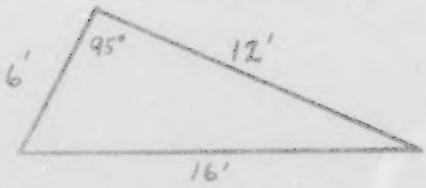
(d) _____



(e) _____

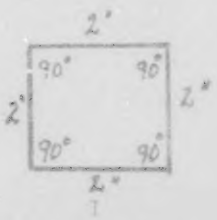


(f) _____

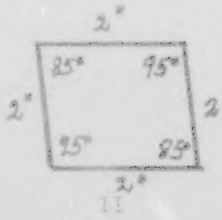


(g) _____ or _____

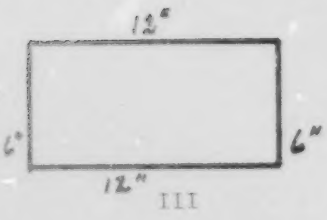
5. All four-sided polygons are called quadrilaterals and are named according to their properties.



I

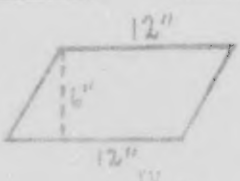


II

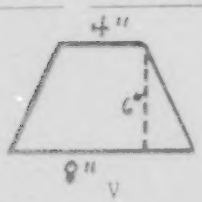


III

_____ _____ _____



IV



V

_____ _____

The above quadrilaterals are the most common four-sided polygons that you will encounter in power mechanics. From the list of properties below see if you can identify and write the name of each quadrilateral in the blanks provided.

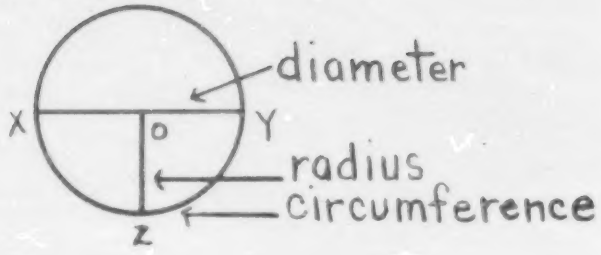
NAME	PROPERTIES
(a) Rectangle- - - - - -	opposite-sides equal, four right angles, opposite sides parallel
(b) Trapezoid- - - - - -	two sides parallel
(c) Parallelogram - - -	opposite sides parallel and equal, opposite angles equal.
(d) Square - - - - - - -	all sides equal, four right angles.
(e) Rhombus- - - - - - -	all sides equal, opposite sides parallel, opposite angles equal.

6. The circle is a geometric figure which you will use very frequently in power mechanics. The circle is classified according to its diameter or radius.

In the drawing to the right the distance from "x" to "y" which passes through the center of the circle is called the diameter, and the distance from "o" to "z" is called the radius. The distance around the circle is called the circumference.

(a) In the space given draw a circle with a 1" diameter.

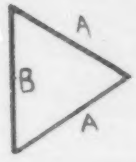
(b) 3/8" radius



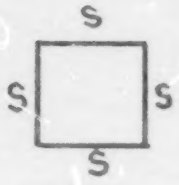
8-3-1 Measuring Geometric Perimeters

1. The sum of the lengths of the sides of a polygon is called the perimeter.

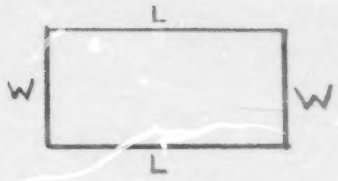
   Measure the sides of the following polygons and record their perimeters in the blanks provided. (Answer to the nearest 16th of an inch.)



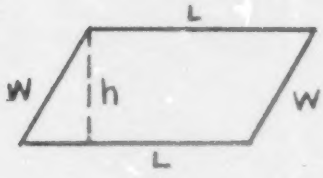
(a)_____



(b)_____

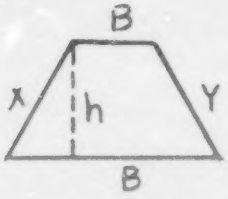


(c)_____

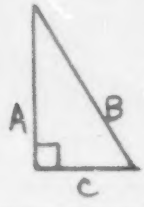


(d)_____

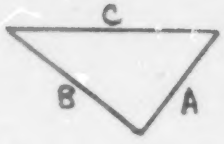
(e)_____



(f)_____

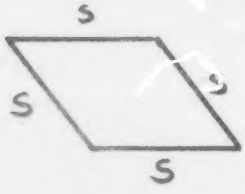


(g)_____



(h)_____

(i)_____



(j)_____

8-4-3 Using the polygons in 8-3-1, write a formula for finding the perimeter of each.

(a) (f)

(b) (g)

(c) (h)

(d) (i)

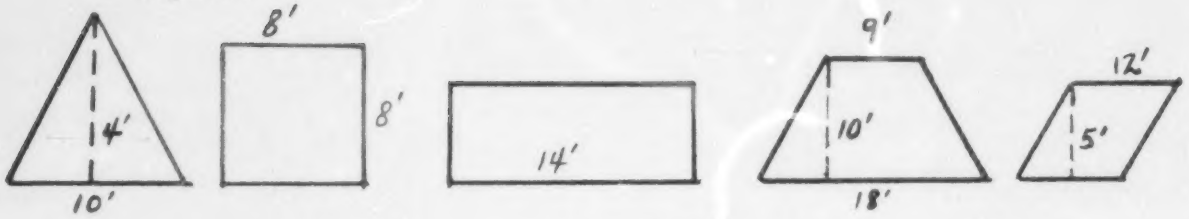
(e) (j)

Find the perimeter of the ploygons whose sides have the following measurements.

Name	Length of sides	Perimeter
triangle	6', 8', 10'	
rectangle	12', 14'	
square	11'	
rhombus	15'	
trapezoid	6', 4', 9', 12'	
parellelogram	4', 9'	

8-5-3 Find areas of geometric figures related to power mechanics.

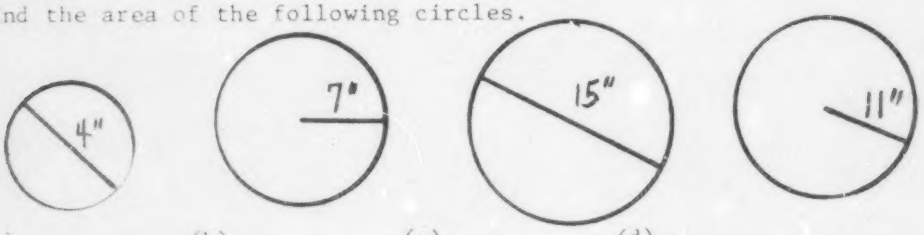
1. Write the formula and find the area of the following geometric figures.



Formula (a)_____(b)_____ (c)_____(d)_____ (e)_____

Area (f)_____(g)_____ (h)_____(i)_____(j)_____

2. Find the area of the following circles.



(a)_____(b)_____(c)_____(d)_____

3. Find the area of a triangle with a height of 3" and a base of 9".

4. What is the area of a square with a side 10' in length?

5. Find the area of a trapezoid with a lower base of 12", an upper base of 9' and a height of 6".

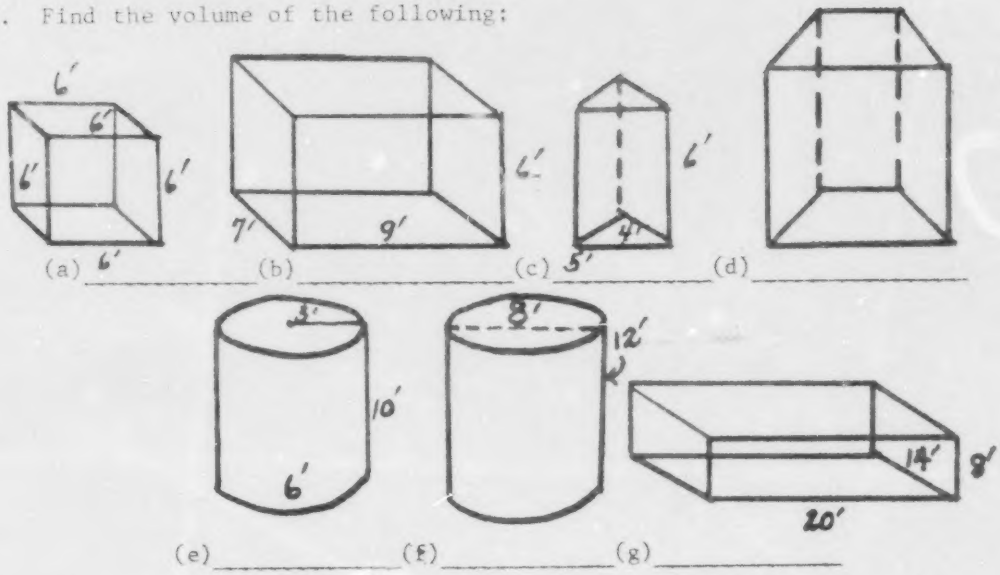
6. Find the area of a rectangle whose length is 16' and width 12'.

7. Find the area of a circle whose radius is 8'.

8. Find the area of a circle whose diameter is 14".

8-6-3 Volumes of Geometric Figures

1. Find the volume of the following:



2. Find the volume of a triangular prism with a base area of 5 square inches and a height of 16 inches.

3. If it takes 7½ gallons of gas to fill a container 1 cubic foot in capacity, how many gallons will it take to fill a tank with a diameter of 4 feet?

4. A rectangular gas tank 8 inches by 2 feet by 5 feet has how many cu i feet capacity?

5. If an oil drum with a diameter of 3' and a height of 5' is 2/3 full of oil, how much oil is in the drum if 1 cubic foot is equal to 6 gallons of oil?

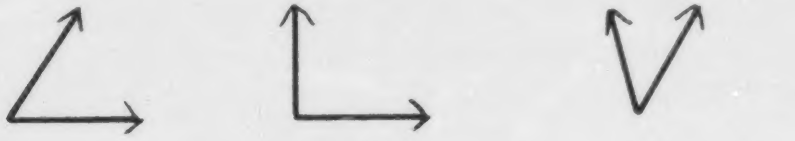
6. Find the total cubic inches displaced in an 8 cylinder engine with each cylinder 4" in diameter and stroke of 3.5 inches?

7. What is the displacement in a 6 cylinder engine with a bore of 3.62" and a stroke of 3.60"?

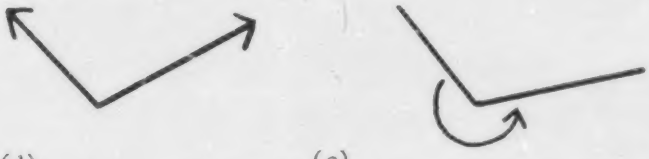
INSTRUCTIONAL MATERIALS

8-7-1 Unit Test on Geometry

1. Measure the following angles to the nearest degree and record their measurements in the blanks provided.



(a)_____ (b)_____ (c)_____



(d)_____ (e)_____

2. Find the perimeter of the following triangles whose sides have the following measurements.

(a) 24', 62', 45' _____

(b) 20', 16', 24' _____

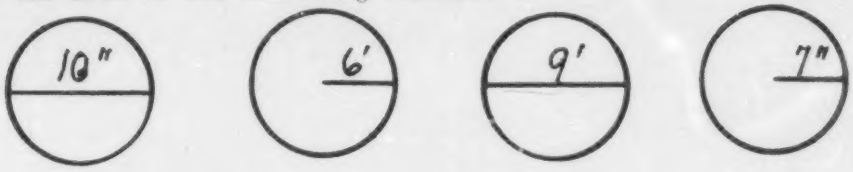
(c) 9", 6", 14" _____

(d) 3', 5', 7' _____

3. Find the perimeter of the following quadrilaterals:

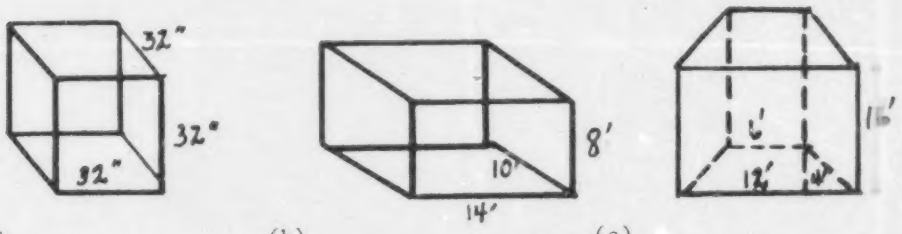
Square	Rectangle	Trapezoid
9"	6', 9'	opposite non-parellel sides 7" + 8" Height 6" Upper Base 9" Lower Base 16"

4. Find the area of the following circles.



(a)_____ (b)_____ (c)_____ (d)_____

5. Find the volume of the following geometric figures:



(a)_____ (b)_____ (c)_____

(d)_____ (e)_____

6. Find the volume of rectangular prisms that have the following dimensions:

(a) L = 2", W = 4", H = 6" _____

(b) L = 4½', W = 2½', H= 3" _____

(c) e = 5' _____

(d) e = 1½' _____

7. Find the volume of cylinders that have the following dimensions:

(a) r = 3', h = 10' _____

(b) d = 4.5', h = 9.2' _____

(c) d = 2½", h = 5 3/4" _____

8. If the diameter of a cylinder is 4 inches and its stroke length is 6 inches, what is the total displacement of an 8 cylinder car?

9. If 231 cu. in. is equivalent to 1 gallon of gas, how many gallons of gas are there in a rectangular gas tank 24" wide, 48" long and 8" deep?

10. If it takes 1 quart of paint to paint 100 sq. ft. of floor space, how many gallons of paint will it take to paint a shop floor that is 50 ft. wide and 125 ft. long?

11. How many fuel pump gaskets can be made from gasket material that has a width of 3 ft. and a length of 4 ft. if each gasket contains 12 sq. in.

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 9

POWERS AND ROOTS

Powers and Square Roots

9-0-0 Upon completion of this topic the students will show a basic understanding of powers and square roots applicable to power mechanics by scoring 70% or above on a teacher made test.

9-1-0 The project teacher will use the overhead projector and lecture to introduce the use of exponents.

9-1-1 Lecture and class discussions
9-1-2 Work sheet, using exponents

9-2-0 The project teacher will use the chalk board and lecture to teach factoring into a product of primes.

9-2-1 Discuss prime and composite numbers
9-2-2 Class prepare a list of prime numbers
9-2-3 Lecture on prime factors and class discussion
9-2-4 Work sheet, prime factors

9-3-0 The project teacher will use lecture and overhead projector to teach finding the square root of perfect squares.

9-3-1 Lecture and class discussion of perfect squares
9-3-2 Work sheet, square root of perfect squares

9-4-0 The project teacher will use the chalk board and lecture to teach finding the square root of numbers other than perfect squares.

9-4-1 Lecture and class discussion
9-4-2 Work sheet, finding square roots

9-5-0 The project teacher will use lecture and class discussion to teach solving practical problems involving powers and square roots.

9-5-1 Lecture and class discussion
9-5-2 Work sheet, problem solving

9-6-0 The project teacher will administer evaluative materials on powers and square roots.

9-6-1 Teacher made test

ACTIVITIES

9-1-2 Work sheet - Using Exponents

An exponent tells how many times a number is used as a factor. For example, 3^4 means 3 x 3 x 3 x 3, thus $3^4 = 81$.

Find the value of the following:

1. 2^3
2. 3^3
3. 4^2
4. 2^5
5. 5^3
6. 7^2
7. 8^3
8. 3^5
9. 10^3
10. 12^2

Rewrite the following using exponents:

1. 3 x 3 x 3 x 3 x 3
2. 12 x 12 x 12
3. 4 x 4
4. 6 x 6 x 6
5. 2 x 2 x 2 x ... x 2 x 2 x 2
6. 10 x 10 x 10 x 10
7. 1 x 1 x 1
8. 5 x 5 x 5
9. 100 x 100
10. 8 x 8 x 8 x 8 x 8

9-2-4 Work sheet - Prime factors

Any number can be expressed as the product of primes. For example, 12 can be written 2 x 2 x 3 so that all of the factors are prime numbers.

Find the prime factors of each of the following:

1. 14
2. 8
3. 16
4. 25
5. 36
6. 50
7. 100
8. 81
9. 125
10. 169
11. 225
12. 500

9-3-2 Work sheet - Finding square roots

Find the square root of the following perfect square numbers:

1. $\sqrt{9}$
2. $\sqrt{16}$
3. $\sqrt{25}$
4. $\sqrt{36}$
5. $\sqrt{49}$
6. $\sqrt{64}$
7. $\sqrt{81}$
8. $\sqrt{100}$
9. $\sqrt{121}$
10. $\sqrt{144}$

Using the table of square roots, find the following:

1. $\sqrt{7}$
2. $\sqrt{10}$
3. $\sqrt{15}$
4. $\sqrt{5}$
5. $\sqrt{97}$
6. $\sqrt{13}$
7. $\sqrt{43}$
8. $\sqrt{21}$
9. $\sqrt{52}$
10. $\sqrt{2}$

9-4-2 Work sheet - Finding square roots by the long method

Find the square root of the following correct to tenths:

1. $\sqrt{81}$
2. $\sqrt{69}$
3. $\sqrt{10.4}$
4. $\sqrt{171}$
5. $\sqrt{175.43}$
6. $\sqrt{81}$
7. $\sqrt{3}$
8. $\sqrt{9.142}$
9. $\sqrt{23.04}$
10. $\sqrt{17145}$

9-5-2 Work sheet = Solving practical problems

1. Using the formula, $A = .7854D^2$, find the area of the following circles:

   a. diameter = 2.25"
   b. diameter = 1 7/8"
   c. radius = 2.4"
   d. radius = 13/16"

2. Using the formula $A = S^2$, find the area of the following squares:

   a. S = 3"
   b. S = 15"
   c. S = 14'
   d. S = .8"
   e. S = 1.5"
   f. S = 5.62"
   g. S = 1/4"

3. Determine the power (P), in watts, required for each of three electrical circuits that draw 12 amperes (I) of current and have a resistance (R) of (a) 10 ohms, (b) 8½ ohms, and (c) 17.62 ohms, respectively. Use the formula $P = I^2R$.

4. Use the horsepower formula given and find the horsepower ratings of the following motors, to the nearest whole number:

$$\text{Horsepower rating} = \frac{(\text{diameter of cylinder})^2 \times (\text{number of cylinders})}{2.6}$$

$$\text{or} \quad H = \frac{D^2N}{2.6}$$

Motor	Number of cylinders	Diameter of cylinders (Bore)
A.	2	4"
B	6	4.2"
C	4	3 1/4"
D	8	3 1/8"
E	12	3.75"

5. Using the formula $D = \sqrt{\frac{S}{\pi}}$, find the value of D correct to two decimal places for each of the following:

   A. S = 9.426
   B. S = 38.704
   C. S = 62.84

6. A heating coil in a dryer uses 16 watts (W). The heat resistance is 25 ohms (O). How many amperes (A) are there in the circuit when $A = \sqrt{\frac{W}{O}}$?

7. What amperage is flowing through an electrical circuit when the wattage is 440 and the resistance is 200?

$$\text{Amperage} = \sqrt{\frac{\text{Watts}}{\text{Resistance}}}$$

8. Find the cylinder diameter (c) of an eight cylinder engine (N) rated at 96.4 horsepower (hp.) when,

$$C = \sqrt{\frac{\text{hp.} \times 2.5}{N}}$$

9. An electrical heating unit has a 20-ohm resistance and uses power at the rate of 2420 watts. Determine the voltage that the heater works on.

$$\text{Voltage} = \sqrt{(\text{watts}) \times (\text{ohms resistance})}$$

10. Find the distance (D), when $D = \sqrt{x^2} - \sqrt{Y^2}$ if $x = 15$ and $y = 12$.

INSTRUCTIONAL MATERIALS

9-6-1 Test - Powers and Roots

Find the value of the following:

1. 3^2
2. 2^5
3. 4^3
4. 5^3
5. 6^3

Rewrite the following using exponents:

6. 4 x 4 x 4 x 4
7. 2 x 2 x 2 x 2 x 2 x 2 x 2
8. 10 x 10 x 10
9. 5 x 5
10. 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1

Find the prime factors of the following:

11. 18
12. 15
13. 28
14. 400
15. 120

Find the square root of the following:

16. $\sqrt{256}$ 17. $\sqrt{289.4}$ 18. $\sqrt{18924}$

Solve the following:

19. The amperes (A) in a circuit = $\sqrt{\frac{\text{Watts (W)}}{\text{Ohms (O)}}}$ Find A when W = 8 and O = 11.

20. Using $L = \sqrt{x^2 + y^2}$, find L when X = 4 and Y = 5.

DIRECTIONS FOR COMPLETING MONITORIAL SHEET

A. Heading Information:

1. Class: Enter the name of the Interest-Based Curriculum Area, eg. Math For Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the monitorial sheet.

4. Objectives (By Number): Enter the numbers of the interim-performance objectives covered by the monitorial sheet. Process and task level objectives should not be entered in this area of the form.

5. Time Interval: Specify the beginning and ending dates for the industrial activities covered on the particular monitorial sheet.

B. Line Item Information:

1. Objectives: Enter the number(s) of the process/task level objectives implemented to bring about the behaviors specified in the interim-performance objectives noted in A-4 above. Do not specify interim-performance objectives at the line item level.

2. Estimated Time: Enter the estimated time for completion of each process/task objective. This should be noted in terms of days to the nearest tenth. One day is equivalent to the instructional activity period for the given curriculum area for a single group of students.

3. Actual Time: Same as #2 above in terms of actual days and tenths of days utilized to carry out the line item objective.

4. Date Completed: Date of completion of the instructional activity.

5. Teacher's Initials: Initial each line item to signify completion of the instructional activity.

C. Additional Information:

1. Objectives Not Covered (List By Number): List those process/task objectives not implemented in the instructional activities for the given interim-performance objectives.

2. Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet): Complete as specified.

Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

UNIT 10

SHOP BUSINESS

SHOP BUSINESS -

10-0-0 Upon completion of this topic the students will show a knowledge of business needed in power mechanics by scoring 70% or above on a teacher made test.

10-1-0 The teacher will use lecture, discussion, and a visit from a shop foreman to teach students how to make out work orders.

10-1-1 Examine and study various work order forms from shops in Natchitoches
10-1-2 Examine and learn how flat rate manuals are used to determine each charge on labor
10-1-3 Work sheet - charging for parts
10-1-4 Work sheet - computing sales tax
10-1-5 Work sheet - complete several work orders
10-1-6 Resource visitor - Discuss with a shop foreman business problems in the shop.

10-2-0 By use of lecture the resource personnel and the project teacher will teach how to figure wages, deductions and take home pay.

10-2-1 Lecture and discussion on computing wages
10-2-2 Work sheet - wages
10-2-3 Work sheet - computing deductions and take home pay
10-2-4 Visit from a mechanic to explain how he is paid

10-3-0 By use of a teacher made test, the teacher will evaluate the students ability to solve business problems related to power mechanics.

10-3-1 Evaluative materials

ACTIVITIES

10 -1-3 Charging for parts

In order to make a profit, a mechanic must sell parts for more than he pays for them. Mark the following prices up 10%.

Example: A water pump cost you $14.50
10% of $14.50 = $1.45
Retail price = $14.50 + $1.45 = $15.95

Wholesale price	Retail price
1. $8.50	_____
2. $7.62	_____
3. $19.40	_____
4. $17.68	_____
5. $27.42	_____
6. $39.77	_____
7. $142.50	_____
8. $66.40	_____
9. $7.68	_____
10. $14.50	_____

Mark the following prices up 20%

1. $4.75	_____
2. $10.20	_____
3. $6.50	_____
4. $9.75	_____
5. $16.20	_____
6. $17.40	_____
7. $18.50	_____
8. $12.20	_____
9. $19.75	_____
10. $4.98	_____

10-1-4 Computing Sales tax

Compute the sales tax for 3%, 4%, and 5% on the following:

Example: 3% of $40.00 = $1.20
4% of $40.00 = $1.60
5% of $40.00 = $2.00

1.	$24.00	_____	_____	_____
2.	$19.70	_____	_____	_____
3.	$14.00	_____	_____	_____
4.	$215.60	_____	_____	_____
5.	$76.40	_____	_____	_____
6.	$9.80	_____	_____	_____
7.	$342.50	_____	_____	_____
8.	$45.00	_____	_____	_____
9.	$76.40	_____	_____	_____
10.	$38.50	_____	_____	_____

10-1-5 Complete work orders for the following:

I. Sales tax is 4%.

1. Tune-up

Parts:

Spark plugs 8 @	$1.05	_____
Points	$3.00	_____
Condenser	$1.20	_____
Wire	$2.40	_____

Labor: 1½ hours @ $4.50 an hour _____

Tax _____

Total cost _____

2. Replace water pump

Parts:

Water pump	$24.40	_____
Belt	$ 3.50	_____
Belt	$ 4.40	_____
Gasket	$ .75	_____

Labor: 2 hours $3.75 an hour _____

Tax _____

Total cost _____

3. Using the following information, figure the total bill for the air conditioning repair job.

Parts:

Seal kit @ $4.50 _____

3 lbs. refrigerant @ $1.75 per pound _____

2 ounces oil @ .30 per ounce _____

42 inches 12/32 inch hose @ $1.60 per ft. _____

2 hose clamps @ $.35 each _____

Labor: 3.4 hours at $7.00 per hour _____

Tax _____

Total cost _____

II. Labor on jobs are usually determined by using the Flat Rate Manual. Using the manual compute the following:

1. Tune-up

Parts:

Points $4.00	_____
Condenser $1.39	_____
Plugs $13.00	_____
Wire $2.40	_____
Flate rate manual labor	_____
5% sales tax	_____
Total cost	_____

2. Rotate tires

Repack front wheel bearings	_____
Replace muffler	_____

Parts:

Grease	$.30	_____
Muffler	$14.60	_____
Clamps 3 @	$1.25	_____

Labor:

	_____
4% sales tax	_____
Total cost	_____

10-2-2 Wages

Compute a mechanics weekly pay for each of the following:

Hours worked:	Hour wage	Weekly pay
1. 40	$3.50	_____
2. 40	$3.50	_____
3. 36	$4.25	_____
4. 44	$4.65	_____
5. 38	$4.50	_____
6. 42	$4.60	_____
7. 48	$2.75	_____
8. 45	$4.20	_____
9. 30	$4.00	_____
10. 25	$4.50	_____

Using the Flat Rate Manual, determine a mechanics wages for the following jobs:

1. tune-up	_____
2. change water pump	_____
3. repack wheel bearings	_____
4. install muffler	_____
5. replace brake drums	_____
Total	_____

10-2-3 Given the following information, compute the take home pay.

Social Security tax	5.3%
State Income tax	2%
Federal Income tax	14%

		Social Security Tax	State Income Tax	Federal Income Tax	Take Home
1.	$160.00	_____	_____	_____	_____
2.	$140.00	_____	_____	_____	_____
3.	$200.00	_____	_____	_____	_____
4.	$170.00	_____	_____	_____	_____
5.	$180.00	_____	_____	_____	_____
6.	$220.00	_____	_____	_____	_____
7.	$120.00	_____	_____	_____	_____
8.	$166.40	_____	_____	_____	_____
9.	$120.00	_____	_____	_____	_____
10.	$135.00	_____	_____	_____	_____

INSTRUCTIONAL MATERIALS

10-3-1 Evaluative Materials

I. Determine the retail price on the following so that the company will make a 50% profit.

1.	Item	Cost	Retail price
a.	points	$2.20	_____
b.	plugs	$8.08	_____
c.	water pump	$14.40	_____
d.	brake shoes	$16.40	_____
e.	radiator	$64.20	_____

2. On the above problems, find the 4% sales tax on each item.

a. _____
b. _____
c. _____
d. _____
e. _____

II. Complete the following work orders. The sales tax is 4% and the labor is $7.50 per hour.

1. Engine Tune-up parts:

a.	points	$3.50
b.	condenser	$1.49
c.	plugs	$14.40
d.	wire	$2.20

Labor 1½ hours

2. Repair brakes

a.	front brake shoes	$13.99
b.	rear brake shoes	$13.99
c.	4-wheel cylinder kits @	$1.49
d.	master cylinder repair kit	$1.79

Labor 4-hours

III. Given the hours worked and pay scale, find the total wages.

1.	Hours worked	Pay	Total wages
a.	16	$4.50	_____
b.	30	$7.25	_____
c.	40	$3.40	_____
d.	18½	$4.30	_____
e.	36	$5.40	_____

2. Compute the take home pay on the following salaries:
Deduct 18% income tax; 2% state tax; 5¼% social security.

		Income tax	State tax	Social Security
a.	$225.00			
b.	$340.00			
c.	$450.00			
d.	$210.00			
e.	$640.00			

APPENDIX A

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Natchitoches Central High School
Natchitoches, Louisiana

Monitorial Sheet

Class_____ Teacher_____ Date_____

Objectives (By Number)_____

Time Interval: _____

Objectives	Estimated Time	Actual Time	Date Covered	Teacher's Initials

Objectives Not Covered (List By Number)_____

_____

Objectives Altered or Added (List By Number; State Adjusted Objective on Back of Sheet)_____

_____

DIRECTIONS FOR COMPLETING TEST RESULTS FOR INTERIM

PERFORMANCE OBJECTIVES

A. Heading Information:

1. Class: Enter the name of the Interest Based Curriculum Area, eg. Math for Industry.

2. Teacher: Enter name of teacher. If more than one teacher is involved, give the name of the teacher managing the instructional activity.

3. Date: Enter the date of submission of the result sheet.

B. Line Item Information:

1. Interim Performance Objective Number: Enter the code number for the interim performance objective for which data are reported.

2. Expected Proficiency Level: Enter proficiency level specified in the interim performance objective.

3. Date Tested: Enter date of testing for the specified interim performance objective.

4. Group Average: Enter the average for the student group tested. Use the same statistic as specified in the interim perform ance objective proficiency level (see number 2 above), eg., if 70% is the proficiency level then group average should be specified in terms of percent correct response.

5. Number of Students Tested: Enter the number of students measured for the specified interim performance objective.

6. Number of students meeting the Objective: Enter the number of students that scored at or above the expected proficiency level as specified in number 2 above.

TEST RESULTS FOR INTERIM PERFORMANCE OBJECTIVES

CLASS _____ TEACHER _____ DATE _____

Interim Performance Objective Number	Expected Proficiency level	Date Tested	Group Average	Number of Students Tested	Number of Students meeting the Objective